

INSTRUCTION MANUAL

SM5600 Satellite Modulator

Software Version 3.1 and later

M2/SM5600/BAS and Options



ENGLISH (UK)

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List of Contents

Chapter 1: Introduction

This chapter identifies the equipment versions covered by this manual; describes the purpose of the equipment in a typical system; provides a summary of its main features; identifies the controls, indicators and connectors in a guided tour of the front and rear panels; and lists the available options.

Chapter 2: Installing the Equipment

This chapter provides a guide to the suitability of an installation; gives detailed procedures for the preparation, installation and configuration of the equipment including **important safety information**; provides pin-out details of the external connectors; and details the power-up/-down procedures.

Chapter 3: Operating the Equipment Locally

This chapter provides a guide to using the local (VT100) user interface; describes the menus, screens and options available to the user; and details the setting-up, configuration and operating procedures.

Chapter 4: Front Panel Control

This chapter describes the menus, screens and options available to the user; and details the setting-up, configuration, operating and monitoring procedures.

Chapter 5: RS-232 Remote Control Protocol

Describes the RS-232 Remote Control protocol via the RS-232/485 or Ethernet port.

Chapter 6: RS-485 Remote Control Protocol

Describes the RS-485 Remote Control protocol via the RS-232/485 port.

Chapter 7: Equipment Description

This chapter gives a brief introduction to some of the principles and techniques used in the design of the equipment to aid in understanding its operation and function; and provides a high-level description of the equipment which identifies the functions of its main constituent parts, cards and modules.

Chapter 8: Preventive Maintenance and Fault-Finding

This chapter details routine maintenance tasks to be performed; provides general servicing advice, and information regarding warranty and maintenance; lists the error messages that may occur, and any appropriate Operator action to be taken; provides general fault-finding information for other types of problem which may be encountered; and provides relevant disposal information.

Chapter 9: File Transfer Protocol (FTP)

Provides information on the FTP interface including firmware, software, logs, and configuration.

Chapter 10: Licence Keys

Provides information on how to obtain Licence Keys and how to enter them by FTP.

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Annex B: Technical Specification

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About this Manual

Introduction

This manual provides instructions and information for the installation and operation of the evolution 5000 SM5600 Satellite Modulator. It should be kept in a safe place for reference for the life of the equipment. Further copies of this manual can be ordered from the address shown on *page vi*. If passing the equipment to a third party, also pass on the relevant documentation.

Revisions

It is not intended that this manual is amended by the issue of individual pages. Any revision will be by a complete reissue.

Issues of this manual are listed below:

Issue	Date	Software Version	Comments
1	Jun 2001	1.00	Initial Issue
1r1	Oct 2001	1.00	Cautions added to pages 3-27 and 4-3. Registered address updated. Contact information and trademarks revised.
2	Jun 2002	2.1	Adds SNMP remote control functionality, a feature not available in earlier software versions. In order to ensure compatibility with the TANDBERG System Manager (TSM) and TANDBERG Device Controller (TDC), the alarm reporting scheme is changed from that implemented in software v1.00. Menu contents and structure have been substantially modified.
3	Nov 2002	3.1	RS-485 Remote Control Interface and L-Band Output option added.

The following manuals are also associated with this equipment:

- ST.QR.E10052: Quick Reference Guide
- ST.TS.SNMP.E10052: SNMP Remote Control

EMC Compliance

This equipment is certified to the EMC requirements detailed in *Annex B, Technical Specification*. To maintain this certification, only use the leads supplied or if in doubt contact TANDBERG Television Customer Services.

Warnings, Cautions and Notes

Heed Warnings

All warnings on the product and in the operating instructions should be adhered to. The manufacturer can not be held responsible for injuries or damage where warnings and cautions have been ignored or taken lightly.

Read Instructions

All the safety and operating instructions should be read before this product is operated.

Follow Instructions

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The safety and operating instructions should be retained for future reference.

WARNINGS...

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NOTES...

Notes provide supplementary information. They are highlighted for emphasis, as in this example, and are placed immediately after the relevant text.

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Customer Services and Technical Training Postal Address

Tandberg Television
Unit 2
Strategic Park
Comines Way
Hedge End
Southampton
Hampshire
SO30 4DA
United Kingdom

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If you need to return equipment for repair, please contact the Customer Services Helpdesk on +44 (0) 23 8048 4455. A Returns Authorisation Number (RAN) will be issued and full details of the unit will be logged. Please ensure the RAN number is clearly marked on the packaging of the unit. The unit should then be sent to the following address:

Tandberg Television – Customer Services
Unit 1
Strategic Park
Comines Way
Hedge End
Southampton
Hampshire
SO30 4DA
United Kingdom

Technical Publications

If you need to contact TANDBERG Television Technical Publications regarding this publication, e-mail: techpubs@tandbergtv.com.

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1.1 Scope of This Manual

1.1.1 What This Manual Describes

This manual describes the functions and operations of the evolution 5000 SM5600 Satellite Modulator and is written for its operators/users. It includes information on the installation and day-to-day care and operation of the unit. It does not include any maintenance information that requires the removal of covers. Removing the covers of this equipment may invalidate any warranty.



Figure 1.1: Modulator Front View

1.1.2 Software/Firmware Versions

This manual has been written to cover the functionality of software version **3.1 and later**. This manual continues to be relevant to subsequent software issues where the functionality of the equipment has not changed. Where a new issue of software changes the functionality, a new issue of this manual is provided.

The software version can be found:

- On the startup screen
- In the local control mode (see *Chapter 3*):
 - ✧ In the Main menu by selecting option 7, Software Update menu and then, from there, choosing option 3, Display Code Versions
 - ✧ In the Test menu by selecting option 3, Version and Build Information (the appropriate entry is the Controller Card, main software version)
- In the front panel menu by selecting Build Information under the System Menu option.

1.1.3 Equipment Models

Each Modulator comprises an enclosure with several cards fitted. This manual covers the current hardware in which the latest firmware may be installed. The marketing code and part numbers are shown in *Table 1.1*.

Table 1.1: Marketing Code Descriptions of Basic Units

Marketing Code	Part Number	Description
M2/SM5600/BAS	E10052	SM5600 Satellite Modulator base unit
M2/SM5600/TS-INPUT	S11756	DVB Transport Stream Input Interface Card
M2/SM5600/IF-OUTPUT	S11417	50-180 MHz Satellite Modulator Card Assembly
SM5600/LBAND-OUT	S12693	L-Band Modulator Card Assembly
M2/SM5600/8PSK	N/A	8PSK Modulation (including QPSK)
M2/SM5600/16QAM	N/A	16QAM Modulation (including QPSK and 8PSK)

1.1.4 Information Labels

Typical Side Panel Information Label

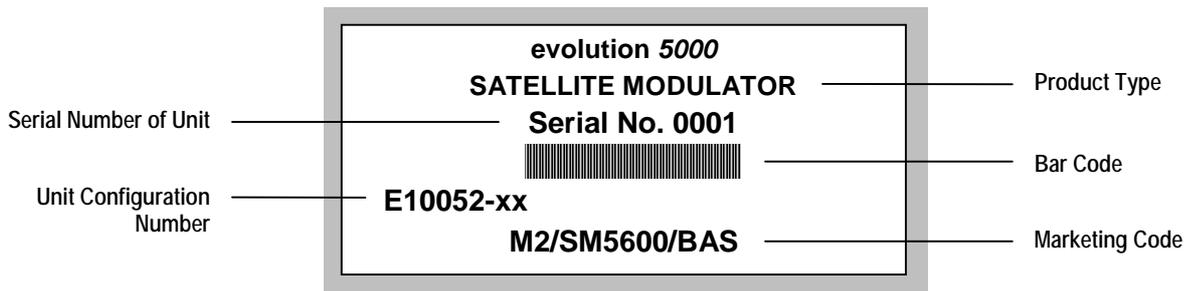


Figure 1.2: Typical Side Panel Information Label

Label Definitions

Table 1.2 explains the terms carried on the Information label.

Table 1.2 :Information Label Description

Label Legend	Explanation
Product Type	Describes the unit in plain English.
Serial Number	A unique number given to the unit.
Unit Configuration Number	<p>The unit configuration number is in two parts separated by a dash.</p> <p>The first part is the E number of the base unit before options are added, but includes the basic boards for functionality.</p> <p>The second part is an internally generated string number that varies with configurations.</p> <p>For example: E10052-54</p> <p>E10052: The base unit excluding any option cards.</p> <p>54: An internally generated number.</p>
Marketing Code	A code which identifies the product for marketing purposes.
Bar Code	A code used for unit identification in the manufacturing process.

1.2 Role of the Modulator

The Modulator is designed specifically for the broadcasting of digital satellite television signals to ETSI standards EN 300 421 (DVB-S) and EN 301 210 (DVB-DSNG).

The unit is designed for the transmission of MPEG-2 digitally-compressed video, audio and data services provided by the evolution 5000 range of products, although it could be used with other types of equipment providing the specification is compatible (see *Annex B, Technical Specification*). The input data to the unit conforms to both the DVB-compliant Synchronous Parallel Interface (DVB-SPI) and the DVB Asynchronous Serial Interface (DVB-ASI).

The Modulator can be configured by its front panel, a VT100 terminal, or a PC running a terminal emulator (see *Figure 1.3*). Alternatively, the Modulator may be controlled remotely, either via its Ethernet ports or RS-232/485 port.

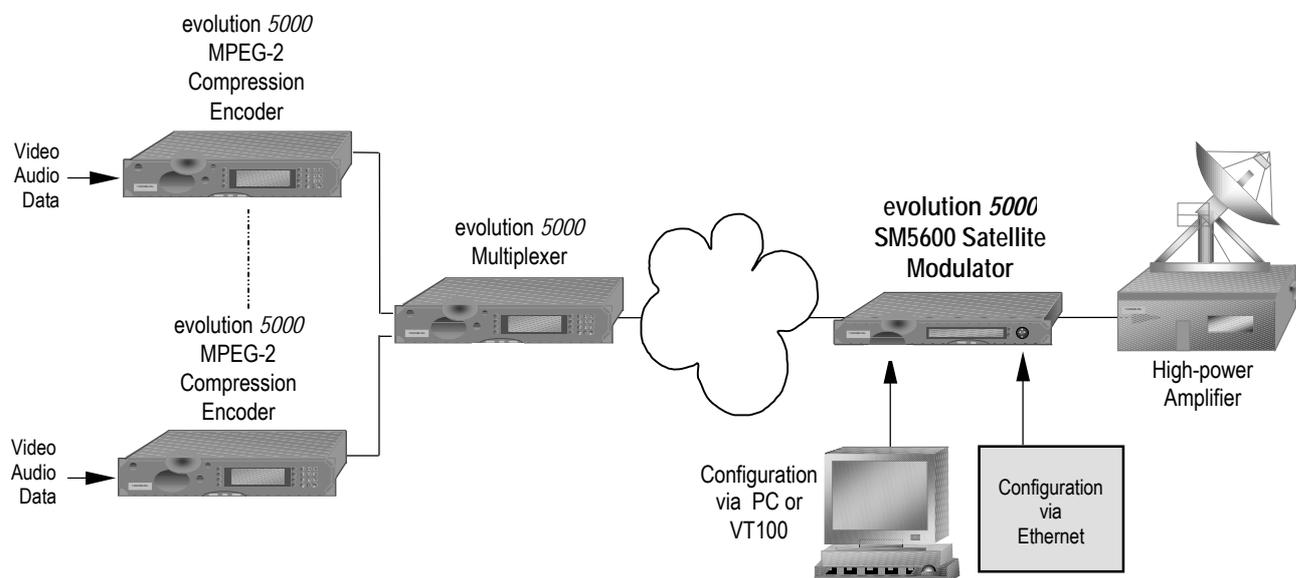


Figure 1.3: Separated Modulator and Multiplexer Configuration

1.3 Summary of Features

1.3.1 MPEG-2 and DVB Compliance

The Modulator normally accepts an MPEG-2 transport stream in either 204-byte or 188-byte packet format. Alternatively, an internally generated Pseudo Random Binary Sequence (PRBS) or Null Packets source may be selected for test purposes. This does not require the presence of a transport stream input

1.3.2 Data Inputs

The Modulator has three transport stream inputs: two DVB-ASI inputs and one DVB-SPI input. The unit has the flexibility to accommodate alternative data input interfaces that may become available in the future. The incoming data may be in any of the following three formats:

- 188 byte packets (188 data bytes, contiguous packets)
- 204 byte packets (188 data bytes and 16 RS coding bytes, the coding bytes are ignored)
- 204 byte packets (188 data bytes and 16 dummy bytes)

1.3.3 IF/L-Band Output

When fitted with the M2/SM5600/IF-OUTPUT option, the Modulator has a tuneable 50-180 MHz IF output. Both main and monitor outputs are provided with the IF option.

Alternatively, when fitted with the SM5600/LBAND-OUT option, the Modulator has a tuneable 950-1750 MHz L-band output. Both main and monitor outputs, and an L-band carrier combining input are provided with the L-band option. 24 V dc power and a 10 MHz reference frequency output, both switchable, are provided via the main L-band output connector for use by an external frequency up-converter.

1.3.4 Forward Error Correction Coding

Noise and interference can cause some bits to be received in error. Therefore, Forward Error Correction (FEC) consisting of Reed-Solomon (RS) coding followed by convolutional coding is used to add extra bits to the transmitted signal. This allows a large number of errors at the receive end to be corrected by Viterbi decoding followed by RS decoding.

Five convolutional code rates are available with BPSK and QPSK modulations: $1/2$, $2/3$, $3/4$, $5/6$, and $7/8$. These provide different compromises between bit-rate and ruggedness. For 8PSK and 16QAM modulations, pragmatic trellis coded modulation (PTCM) is used. PTCM code rates of $2/3$, $5/6$ and $8/9$ are available with 8PSK modulation. PTCM code rates of $3/4$ and $7/8$ are available with 16QAM modulation.

Data are interleaved between the outer RS Encoder and the inner convolutional or PTCM Encoder in order to aid error correction techniques at the Receiver.

1.3.5 Modulation Schemes

BPSK and QPSK modulations are available as standard with 8PSK or 8PSK+16QAM available as options.

1.4 Key Features

- QPSK modulation in accordance with ETSI standards EN 300 421 (DVB-S) and EN 301 210 (DVB-DSNG)
- Variable symbol rate operation: 1 to 48 Msymbol/s
- User selectable spectrum roll-off factor: 20%, 25%, 30% and 35%
- IF output frequency: 50 to 180 MHz, tuneable in 1 kHz steps (S11417 50-180 MHz IF output option)
- L-band output frequency: 950 to 1750 MHz, tuneable in 1 kHz steps (S12693 L-band output option)
- Low spurious IF/L-band outputs
- Front panel LCD display and 6-button keypad
- RS-232/485 control, backwards compatible with System 3000 Satellite Modulator
- Dual-redundant 10BaseT Ethernet control
- Software and firmware easily upgraded by remote Ethernet FTP
- Feature enabling by factory entry of licence keys

1.5 DVB Applications

- Satellite DTH broadcasting
- Satellite distribution
- DSNG systems where a separate Modulator is required
- SCPC and MCPC systems

1.6 Non-DVB Applications

- Telecommunications
- Internet backbone

1.7 Additional Features for Greater Flexibility

1.7.1 Spectrum Sense

The Modulator output spectrum can be reversed if required. This gives greater flexibility when converting the signal to RF (Ku-band or C-band), since the choice in local oscillator frequency for the conversion can itself either lead to a normal or reversed spectrum.

1.7.2 Control and Monitoring

Local Control

Control and monitoring may be performed locally via a **VT100** terminal or a PC running appropriate software using the RS-232/485 port.

Remote Control

In addition to the RS-232/485 port, remote control is possible using either one of the Ethernet ports. The user may also control the Modulator via Telnet (see *Chapter 3, Operating the Equipment Locally*).

User Selectable Functions

The control and monitoring functions which may be performed by both types of terminal are similar. The user may set, amongst others:

- Transport stream input source, PRBS or Null Packets selection
- Bit-rate or symbol rate
- Modulation format: BPSK, QPSK, 8PSK (option), 16QAM (option)
- FEC code rate
- IF frequency
- IF power
- IF Output on/off
- Modulation on/off
- Spectrum sense
- Health/status monitoring
- Self-tests

1.8 Guided Tour

1.8.1 Construction

The Modulator is constructed using a shielded self-ventilated enclosure. All inputs and outputs are via rear-panel connectors. The unit may be operated freestanding or mounted in a 19-inch rack; 1U rack height is required.

1.8.2 Controls and Indications

Operating Controls

The Modulator may be controlled by the LCD display and pushbutton key pad. The front panel offers various interface levels, from simple monitoring to full Modulator control (refer to *Chapter 4, Front Panel Control*).

Front Panel Indicators

The Modulator provides two LED indicators. These are located at the left-hand side of the unit (see *Figure 1.4*).

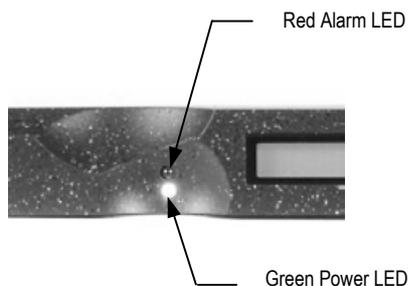


Figure 1.4: Front Panel LEDs

Table 1.3: Modulator LED Indicators

Indicator	Description
Alarm	The red LED indicates when an alarm condition is present.
Power	The green LED is lit when ac power is being received.

1.8.3 Rear Panel Connectors

All input and output connectors are located at the rear panel (see *Figure 1.5*). All the connectors, except the power connector, are physically located on the separate modules that comprise the Modulator.

For pin-out information, see *Chapter 2, Installation*. For specifications of the connector interfaces, see *Annex B, Technical Specification*.



Figure 1.5: View of the Modulator Rear Panel (IF Output Option)

1.9 Option Modules

The SM5600 Satellite Modulator chassis design allows the fitting of a range of input option modules (when available), giving different input processing functionality and the capacity to process input streams of different formats.

The basic configuration of the Modulator comprises a Host Controller Card (S11340). The following options are also available:

- DVB Transport Stream Input Interface Card (S11756) (required option)
- 50-180 MHz Satellite Modulator Card Assembly (S11417)
- L-Band Modulator Card Assembly (S12693)

NOTE...

One of either the 50-180 MHz Satellite Modulator Card Assembly or the L-Band Modulator Card Assembly is a required option. Both of these options cannot be fitted in the same Modulator.

1.10 Getting Started

The following check list provides a guide as to what needs to be done to get the equipment up and running.

1. Switch on the Modulator. With the Modulator correctly installed and connected to the input and output equipment, switch on the unit in accordance with the instructions given in *Chapter 2, Installation*. Confirm that it powers up correctly. If it does not, refer to *Chapter 7, Preventive Maintenance and Fault-finding*.
2. Establish local or remote control. Connect the relevant terminal to the RS-232/485 port or the Ethernet Port (1 or 2). Ensure the terminal is switched on and operational (see *Chapter 3, Operating the Equipment Locally* for instructions on how to establish control from the local terminal or from the remote terminal).

NOTE...

The rear panel connector is compatible with either RS-232 or RS-485, depending upon the mode selected on the Modulator. (See *Section 3.7 System Menu, Option 4, Serial Port Configuration*.)

3. Select configuration parameters. Set the required configuration parameters (see *Chapter 3, Operating the Equipment Locally* for instructions on how to select parameters from the local terminal).
4. Implement the configuration. Ensure the required configuration parameters are sent from the terminal to the Modulator and that they are implemented.

NOTE...

A quick reference guide is given in *Annex C* of this manual.

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Installing the Equipment

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2.1 Read This First!

2.1.1 Handling

The Modulator must be handled and installed carefully and thoughtfully to prevent safety hazards and damage.

2.1.2 Installing the Equipment

Ensure the personnel designated to fit the unit have the appropriate skills and knowledge. If in any doubt, contact TANDBERG Television Customer Services (see *Preliminary Pages* for contact details).

Installation of the product should follow these instructions, and should only use installation accessories recommended by the manufacturers. When rack mounted, this equipment must have shelf supports as well as being fixed at the front panel.

Do not use this product as a support for any other equipment.

2.1.3 Lifting

Although this product only weighs approximately 8kg (17.6 lb), in some circumstances it might be awkward to lift. In which case, do not attempt to lift or move it without proper assistance or equipment. If in doubt, get help.

2.1.4 Mechanical Inspection

Inspect the equipment for damage-in-transit. If in doubt, please contact TANDBERG Customer Services (see *Preliminary Pages*).

WARNING...

REMOVING THE COVERS OF THIS EQUIPMENT MAY INVALIDATE ANY WARRANTIES, CAUSE A SAFETY HAZARD OR/AND AFFECT THE EMC PERFORMANCE. CHECK WITH TANDBERG TELEVISION CUSTOMER SERVICES.

2.1.5 Moving the Equipment Safely



Do not place this product on an unstable cart, stand, bracket, or table. The product may fall, causing serious injury and serious damage to the product. Use only with a cart, stand, bracket or table recommended by TANDBERG Television.

An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn. Do not move or carry the equipment whilst it is still connected to the supply or other leads, is live, or is in operation.

2.1.6 Fixing

The Modulator is designed for fixed use only and has been shipped with fixing brackets suitable for a standard 19 inch rack. When installed in a rack, it should be secured using the fixing brackets. In addition, support shelves must be used to reduce the weight on the brackets. Ensure it is firmly and safely located and it has an adequate flow of free-air.

2.1.7 Ventilation

Openings in the Covers

Openings in the cabinet are provided for ventilation. These ensure reliable operation of the product and protect it from overheating. These openings must not be blocked or covered.

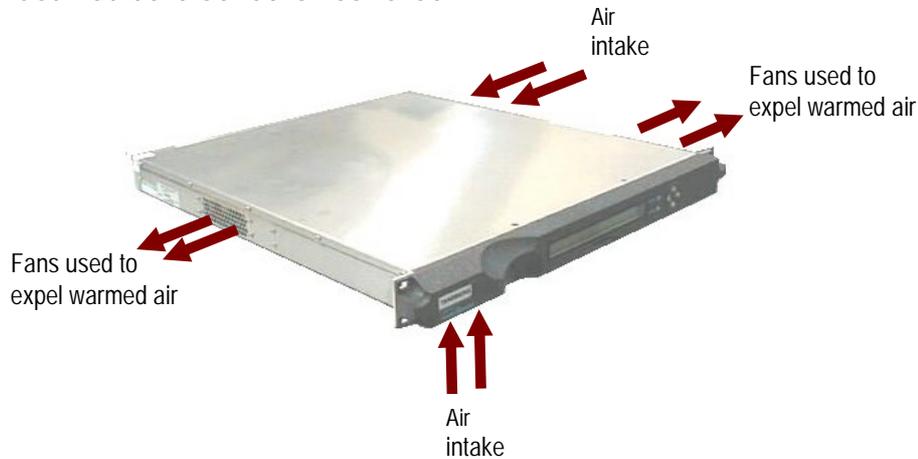


Figure 2.1: Air-flow Through the Equipment

Care in Positioning

CAUTIONS...

1. The fan contained within this unit is not fitted with a dust/insect filter. Pay attention to the environment in which it is to be used.
2. Do not install units so that the air intake of one aligns with the outlet on another. Provide baffles and adequate spacing.

The Modulator should never be placed near or over a radiator or other source of heat. It should not be placed in a built-in installation such as a rack unless proper ventilation is provided and the instructions have been adhered to.

Allow at least 50 mm free air-space at each side of the equipment to ensure adequate cooling. Units in racks can be stacked without the need for ventilation panels between them. Racks containing stacked equipment may need to be forced air-cooled to reduce the ambient temperature within the rack.

Protection from Moisture

Do not install this equipment in areas of high humidity or where there is a danger of water ingress.

Environment

The Modulator is intended to operate in ambient air temperature conditions in the range 0°C to +50°C, and relative humidity 0% to 90% (non-condensing). See *Annex B, Technical Specification* for a full specification.

2.1.8 Installing Cables - Safety

Power supply cables should be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cables at plugs, convenience receptacles, and the point where they exit from the appliance.

Do not run ac power cables in the same duct as signal leads. Do not move or install equipment whilst it is still attached to the mains supply. Ensure safety and ESD precautions are observed whilst inter-connecting equipment.

2.1.9 Lightning Protection

WARNING...

IF THE MODULATOR HAS BEEN SUBJECT TO A LIGHTNING STRIKE OR POWER SURGE WHICH HAS STOPPED IT WORKING, DISCONNECT THE POWER IMMEDIATELY. DO NOT REAPPLY POWER UNTIL IT HAS BEEN CHECKED FOR SAFETY. IF IN DOUBT, CONTACT TANDBERG TELEVISION CUSTOMER SERVICES.

Where appropriate, ensure this product has an adequate level of lightning protection. Alternatively, during a lightning storm or when it is left unattended and unused for long periods of time, unplug it from the supply outlet and disconnect the antenna or cable system. This will prevent damage to the product due to lightning and power line surges.

2.2 EMC Compliance Statements¹

2.2.1 EN 55022 / AS/NZS 3548

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

2.2.2 FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

¹ The EMC information was correct at the time of manufacture. The EMC tests were performed with the Technical Earth attached.

2.3 Mains Operating Voltage, Fusing and Earthing

2.3.1 AC Power Supply

The Modulator operates from a wide-ranging mains power supply (100-120 V or 220-240 Vac 50/60 Hz nominal) and is designed for use in ambient air temperature in the range 0°C to +50°C. There are no links etc. to be altered for operation from different supply voltages. The full Technical Specification is given in *Annex B, Technical Specification*.

WARNING...

THIS EQUIPMENT SHOULD ONLY BE OPERATED FROM THE TYPE OF POWER SOURCE INDICATED ON THE MARKING LABEL. IF YOU ARE NOT SURE OF THE TYPE TO YOUR BUSINESS, CONSULT YOUR APPLIANCE DEALER OR LOCAL POWER COMPANY. DO NOT OVERLOAD WALL OUTLETS AND EXTENSION CORDS AS THIS CAN RESULT IN A RISK OF FIRE OR ELECTRIC SHOCK.

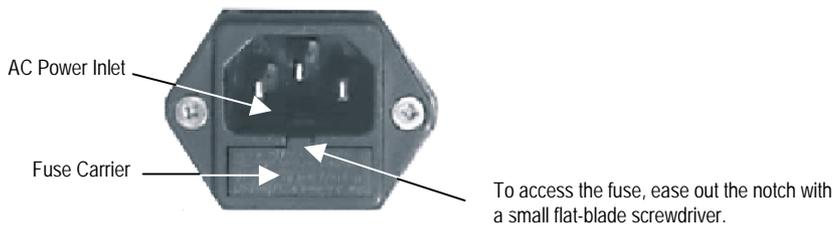


Figure 2.2: AC Power Inlet Assembly

Table 2.1: Fuse Information

Item	Specification
Fuse	Single pole, fitted in live conductor in power input filter at rear of unit.
Fuse type	5 mm x 20 mm anti-surge (T) HBC, IEC/EN 60127-2 Sheet 5
Fuse rating	5 A
Fuse rated voltage	250 Vac
Power lead connector fuse (if appropriate)	5 A minimum

NOTE...
See *Annex B, Technical Specification* for more fuse information.

2.3.2 Technical Earth



NOTE...
The Technical Earth bolt is M4 Pan head with a maximum length of 14 mm.

Position of the Technical Earth

Figure 2.3: Location of the Technical Earth

The terminal marked \perp at the rear panel is a Technical Earth and is provided to:

1. Ensure all equipment chassis fixed within a rack are at the same technical earth potential. To do this, connect a wire between the Technical Earth terminal and a suitable point on the rack.
2. Eliminate the migration of stray charges when connecting between equipment.

2.3.3 Connecting the Equipment to the AC Power Supply

As there is no mains switch fitted to this unit, ensure the local ac power supply is switched OFF before connecting the supply cord.

Connect the supply cord to the Modulator and then to the local supply.

2.3.4 AC Power Supply Cord

General

A two-metre mains supply cord is supplied with this product. It is fitted with a moulded plug suitable for either the USA, UK or mainland Europe as advised at the time of ordering.

NOTE...

The Modulator is not fitted with an ac power supply ON/OFF switch. Ensure the socket-outlet supplying the Modulator is installed near the unit so that it is easily accessible.

Wire Colours

The wires in the supply cord are coloured as shown in *Table 2.2*.

Table 2.2: Supply Cord Wiring Colours

	UK (BS 1363)	EUROPE (CEE 7/7)	USA (NEMA 5-15P)
Earth:	Green-and-yellow	Green-and-yellow	Green
Neutral:	Blue	Blue	White
Live:	Brown	Brown	Black

If the colours do not correspond with the coloured markings identifying the terminals in a locally supplied plug, proceed as in *Table 2.3*. The inclusion of *Table 2.3* is for reference.

Table 2.3: Non-standard Supply Cord Wire Colours

Wire Colour (UK)	Action
green-and-yellow	...must be connected to the terminal in the plug which is marked with the letter E or the safety earth symbol \perp or coloured green or green-and-yellow.
blue	...must be connected to the terminal in the plug which is marked with the letter N or coloured black.
brown	...must be connected to the terminal in the plug which is marked with the letter L or coloured red.

2.4 Connecting up the Modulator

2.4.1 General

When the Modulator has been installed in its intended operating position it is ready to be connected to the rest of the system equipment (see *Section 2.5 Signal Connections* for pin-out details of the unit connectors).

Unused connectors on this equipment do not need to be terminated.

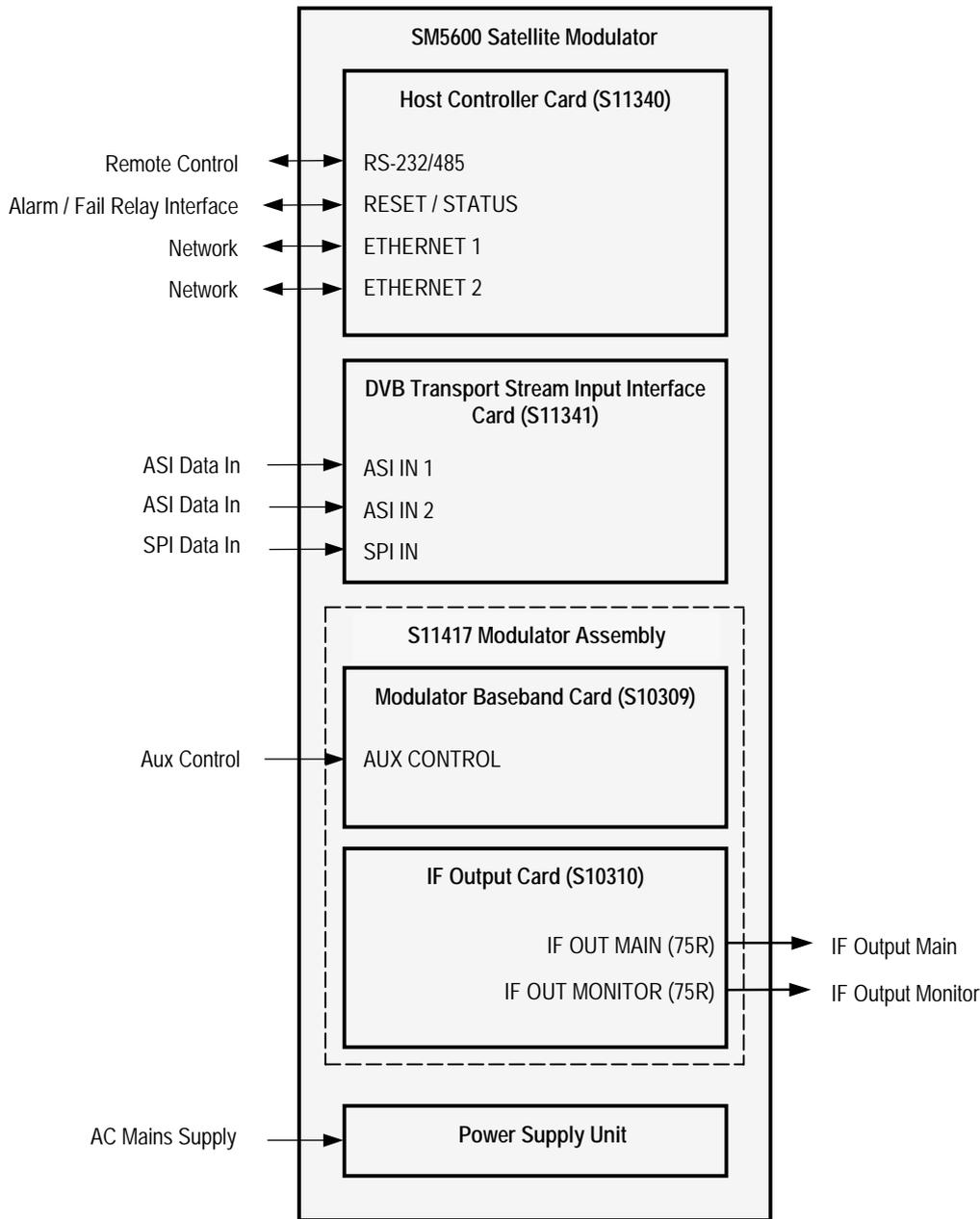


Figure 2.4: Equipment Connections – Configuration with IF Output Option

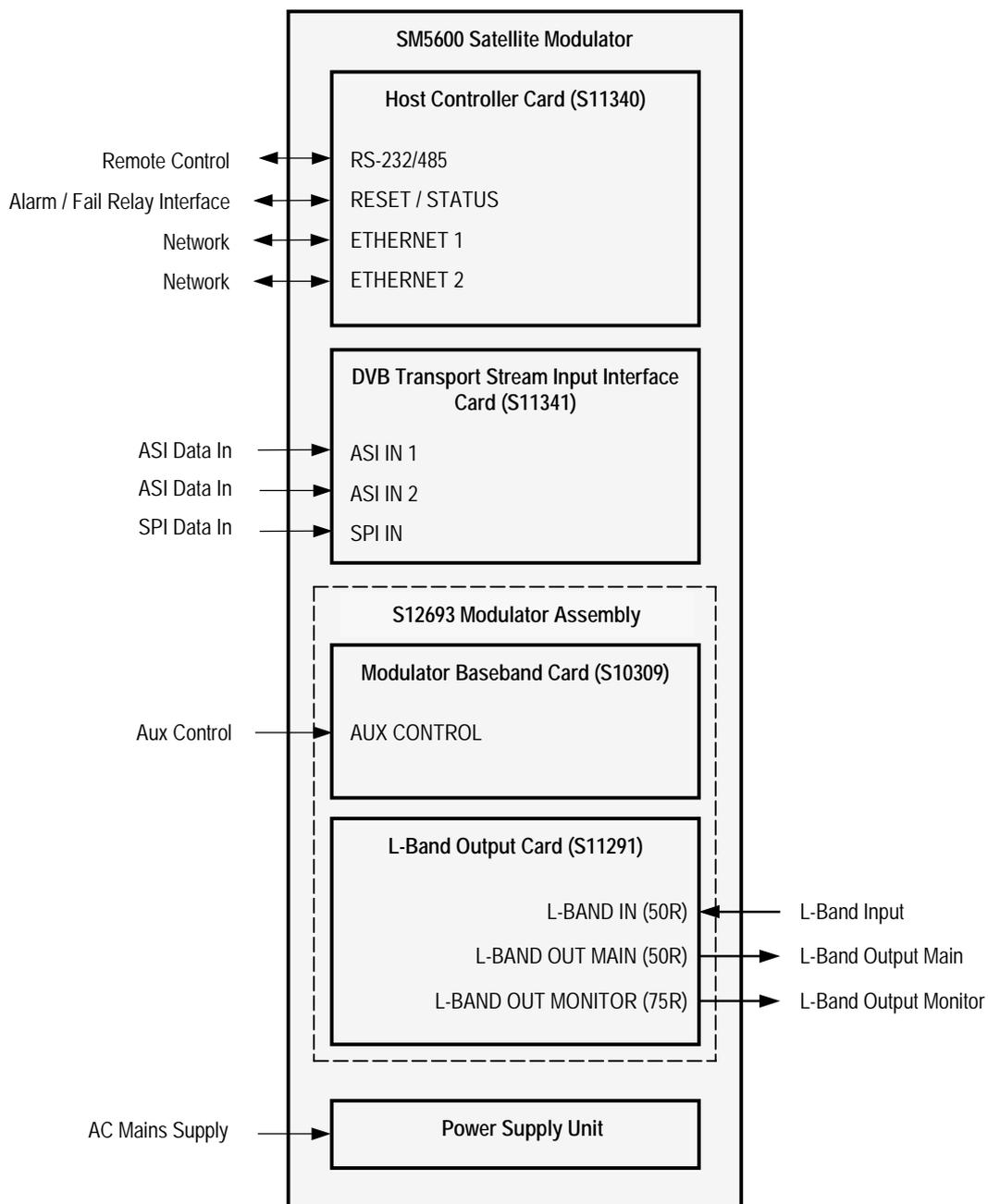


Figure 2.5: Equipment Connections – Configuration with L-Band Output Option

2.4.2 Transport Stream Input

Connect an MPEG-2 transport stream, either in ASI format to one of the two ASI IN connectors, or in SPI format to the SPI IN connector (see *Annex B, Technical Specification* for details). More than one transport stream may be fed into the Modulator simultaneously, but only one is selected as the modulator input. This facility may be used for input redundancy purposes but automatic switching is not supported.

2.4.3 L-Band Input (Available Only With the L-Band Output Option)

If required, connect the L-BAND IN connector to the output of an auxiliary modulator. This facility is useful for combining carriers for transmission via the same uplink equipment.

2.4.4 Modulated Output

IF Output Option

Connect the IF OUT MAIN connector to the appropriate up-converter or other equipment using good quality coaxial cable with a characteristic impedance of 75 Ω .

If required, connect the IF OUT MONITOR connector either to a spectrum analyser or, via a suitable up-converter, to an IRD for local monitoring purposes.

L-Band Output Option

CAUTION...

A 24 V dc voltage is present at the L-BAND OUT MAIN connector when the up-converter dc power is switched on. Do not connect this output directly to a spectrum analyser or other sensitive equipment. The use of a dc block is recommended.

Connect the L-BAND OUT MAIN connector to the appropriate up-converter or other equipment using good quality coaxial cable with a characteristic impedance of 50 Ω . If required by the up-converter, switch on the up-converter dc power and/or the 10 MHz reference frequency output.

If required, connect the L-BAND OUT MONITOR connector either to a spectrum analyser or to an IRD for local monitoring purposes.

2.4.5 Local/Remote Control

Select a method for configuring the Modulator. Connect the local control terminal to connector RS-232/485.

NOTE...

The rear panel connector is compatible with either RS-232 or RS-485, depending upon the mode selected on the Modulator. (See *Section 3.7 System Menu, Option 4, Serial Port Configuration.*)

Alternatively, connect ETHERNET port 1 or 2 into a suitable 10BaseT network connection for network based remote operation. These two Ethernet ports are duplicate Ethernet inputs provided to allow network redundancy. See *Chapter 3, Terminal Control and Operation* for details of the protocol used and the control and monitoring commands which are available.

2.4.6 Power Supply

Mains Operating Voltage, Fusing and Earthing provides details of power supply connection, earthing and safety. Read all the instructions carefully and take note of all warnings and cautions.

2.4.7 Reset/Status

If required, connect to an external status monitoring device.

2.4.8 Technical Earth

Connect the Technical earth to a suitable point on the equipment.

2.5 Signal Connections

2.5.1 General

All signal input/output connectors are located at the rear panel of the Modulator. For a detailed interface specification see *Annex B, Technical Specification*.

Always use the specified cables supplied for signal integrity and compliance with EMC requirements.

2.5.2 S11340 Host Controller Card

Rear Panel View

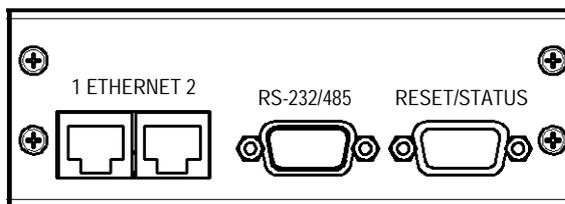


Figure 2.6: Host Controller Card Rear Panel

RS-232/485

A 9-way D-type male subminiature connector provides a control interface which is user configurable as either RS-232 or RS-485, and as either a local (terminal) control or remote control port.

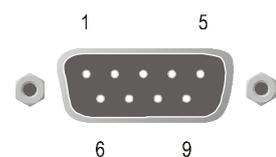
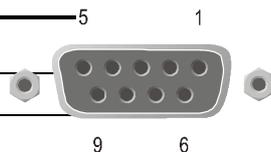


Table 2.4: RS-232/485 Connector Pin-outs

Item	Specification	
Connector type	9-way D-type, Male	
Connector designation	RS-232/485	
Pin-outs	RS-232 Connections	RS-485 Connections
	Pin 1 — Data Carrier Detect (DCD) Pin 2 — Receive Data (RxD) Pin 3 — Transmit Data (TxD) Pin 4 — Data Terminal Ready (DTR) Pin 5 — Ground Pin 6 — Data Set Ready (DSR) Pin 7 — Request to Send (RTS) Pin 8 — Clear to Send (CTS) Pin 9 — Ring Indicator (RI)	Pin 1 — Transmit Data - (TxD-) Pin 2 — Transmit Data + (TxD+) Pin 3 — Request to Send - (RTS-) Pin 4 — Request to Send + (RTS+) Pin 5 — Ground Pin 6 — Receive Data - (RxD-) Pin 7 — Receive Data + (RxD+) Pin 8 — Clear to Send - (CTS-) Pin 9 — Clear to Send + (CTS+)



NOTE...
 The rear panel connector is compatible with either RS-232 or RS-485, depending upon the mode selected on the Modulator. (See *Section 3.7 System Menu, Option 4, Serial Port Configuration*.)

Reset/Status

A 9-way D-type female subminiature connector provides an alarm relay interface which can be used to remotely signal equipment or input signal failure. The **fail relay** is driven by an equipment failure and the **alarm relay** is driven by an equipment alarm (see *Chapter 7, Preventive Maintenance and Fault-finding*).

Table 2.5: Reset/Status Connector Pin-outs

Item	Specification
Connector type	9-way D-type, Female
Connector designation	RESET / STATUS
Pin-outs	Pin 1 — Protective Ground - Cable Shield Pin 2 — FAIL (common) Pin 3 — ALARM (make to pin 8 when OK) Pin 4 — ALARM (make to pin 8 when not OK) Pin 5 — Reset (line 2) (connect to pin 9 for remote reset) Pin 6 — FAIL (make to pin 2 when OK) Pin 7 — FAIL (make to pin 2 when not OK) Pin 8 — ALARM (common) Pin 9 — Reset (line 1) (connect to pin 5 for remote reset)

Ethernet 1, Ethernet 2

The Ethernet ports are used to provide network connections for the Modulator. Both Ethernet ports may be connected simultaneously for network redundancy purposes. The input to ETHERNET 2 is ignored if an input to ETHERNET 1 is detected.

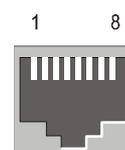


Table 2.6: Ethernet Pin-outs (2 off)

Item	Specification
Connector type	RJ-45
Connector designations	ETHERNET 1 ETHERNET 2
Pin-outs (Unused pins not connected)	Pin 1 — Tx Out (+) Pin 2 — Tx Out (-) Pin 3 — Rx In (+) Pin 6 — Rx In (-)

2.5.3 S11417 50-180 MHz Satellite Modulator Card Assembly (Option Slot 1)

Rear Panel View

NOTE...

The S11417 50-180 MHz Satellite Modulator Card Assembly includes the S10309 Modulator Baseband Card and the S10310 IF Output Card.

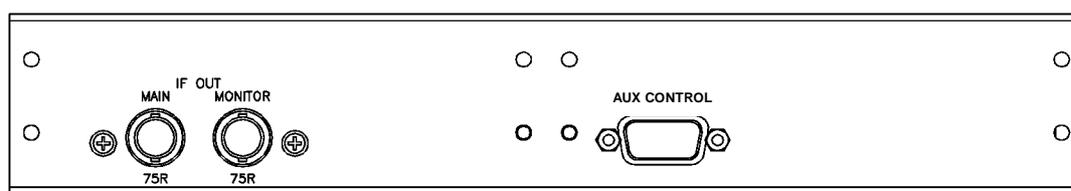


Figure 2.7: S11417 50-180 MHz Satellite Modulator Card Assembly Rear Panel

Aux Control

A 9-way D-type male subminiature connector provides an opto-coupled IF Mute input for externally switching the IF Output on/off.

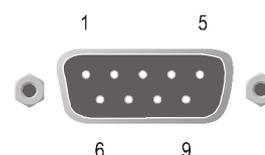


Table 2.7: Aux Control Pin-outs

Item	Specification
Connector type	9-way D-type, Male
Connector designation	AUX CONTROL
Pin-outs	Pin 1 — IF_MUTE_VCC Pin 2 — Do not connect Pin 3 — Do not connect Pin 4 — Not Connected Pin 5 — IF_MUTE_COM (Ground) Pin 6 — IF_MUTE+ Pin 7 — Not Connected Pin 8 — Not Connected Pin 9 — IF_MUTE-

The operation of the IF Mute function is as follows.

When there is no voltage applied between the pins designated IF_MUTE+ and IF_MUTE-, the IF output is switched on/off under software control by whichever method of configuring the Modulator has been selected. This is the default state when there are no connections to the AUX CONTROL connector.

When a dc voltage of nominally 5 V is applied between IF_MUTE+ and IF_MUTE-, the IF output is switched off regardless of the configured state of the Modulator. This may be achieved conveniently by connecting IF_MUTE+ to IF_MUTE_VCC and IF_MUTE- to IF_MUTE_COM, e.g. using external relay contacts.

IF Output (Main)

75 Ω BNC socket provides an IF output.



Table 2.8: IF Output Connector (Main)

Item	Specification	
Connector type	BNC 75 Ω Female	
Type	Analogue	
Connector designation	IF OUT MAIN	
Pin-outs	Centre	IF Output
	Screen	Ground

IF Output (Monitor)

75 Ω BNC socket provides an IF output used for monitoring.



Table 2.9: IF Output Connector (Monitor)

Item	Specification	
Connector type	BNC 75 Ω Female	
Type	Analogue	
Connector designations	IF OUT MONITOR	
Pin-outs	Centre	IF Output
	Screen	Ground

2.5.4 S12693 L-Band Modulator Card Assembly (Option Slot 1)

Rear Panel View

NOTE...

The S12693 L-Band Modulator Card Assembly includes the S10309 Modulator Baseband Card and the S11291 L-Band Output Card.

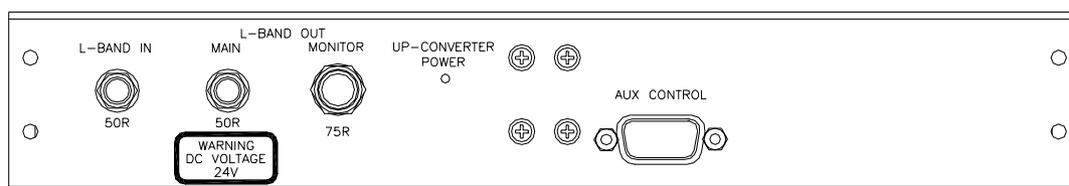


Figure 2.8: S12693 L-Band Modulator Card Assembly Rear Panel

Aux Control

A 9-way D-type male subminiature connector provides an opto-coupled IF Mute input for externally switching the L-Band Output on/off.

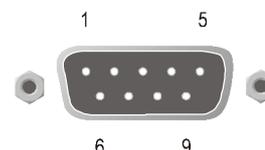


Table 2.10: Aux Control Pin-outs

Item	Specification
Connector type	9-way D-type, Male
Connector designation	AUX CONTROL
Pin-outs	Pin 1 — IF_MUTE_VCC Pin 2 — Do not connect Pin 3 — Do not connect Pin 4 — Not Connected Pin 5 — IF_MUTE_COM (Ground) Pin 6 — IF_MUTE+ Pin 7 — Not Connected Pin 8 — Not Connected Pin 9 — IF_MUTE-

The operation of the IF Mute function is as follows.

When there is no voltage applied between the pins designated IF_MUTE+ and IF_MUTE-, the L-Band Output is switched on/off under software control by whichever method of configuring the Modulator has been selected. This is the default state when there are no connections to the AUX CONTROL connector.

When a dc voltage of nominally 5 V is applied between IF_MUTE+ and IF_MUTE-, the L-Band Output is switched off regardless of the configured state of the Modulator. This may be achieved conveniently by connecting IF_MUTE+ to IF_MUTE_VCC and IF_MUTE- to IF_MUTE_COM, e.g. using external relay contacts.

L-Band Input

50 Ω SMA socket provides an L-band input.



Table 2.11: L-Band Input Connector

Item	Specification
Connector type	SMA 50 Ω Female
Type	Analogue
Connector designation	L-BAND IN
Pin-outs	Centre — L-Band Input Screen — Ground

L-Band Output (Main)

50 Ω SMA socket provides an L-band output.



Table 2.12: L-Band Output Connector (Main)

Item		Specification
Connector type		SMA 50 Ω Female
Type		Analogue
Connector designation		L-BAND OUT MAIN
Pin-outs	Centre	L-Band Output
	Screen	Ground

L-Band Output (Monitor)

75 Ω F-type socket provides an L-band output used for monitoring.



Table 2.13: L-Band Output Connector (Monitor)

Item		Specification
Connector type		F-type 75 Ω Female
Type		Analogue
Connector designations		L-BAND OUT MONITOR
Pin-outs	Centre	L-Band Output
	Screen	Ground

2.5.5 S11341 DVB Transport Stream Input Interface Card (Option Slot 2)

NOTE...
The S11341 DVB Transport Stream Input Interface Card is part of the S11756 assembly.

Rear Panel View

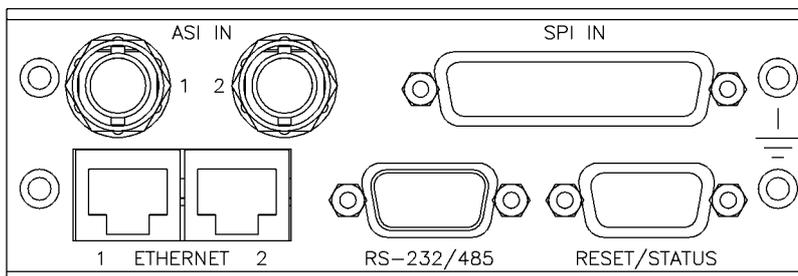


Figure 2.9: DVB Transport Stream Input Interface Card Rear Panel

Transport Stream In, DVB ASI Copper Input

Two BNC, female 75 Ω connectors provide DVB-compliant ASI copper connections at a fixed line transmission rate of 270 Mbit/s.



Table 2.14: DVB ASI Copper Connectors (2 off)

Item	Specification
Connector type	BNC 75 Ω Female
Connector designations	ASI IN 1 ASI IN 2
Pin-outs	Centre Signal Shield Ground/Chassis

Transport Stream In, DVB SPI

This 25-way, D-type female subminiature connector provides a DVB-compliant synchronous parallel interface for receiving an MPEG-2 transport stream.

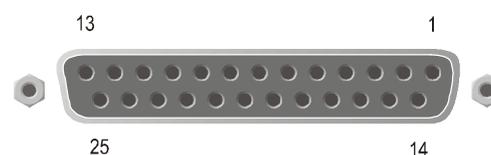


Table 2.15: DVB SPI Connector Pin-outs

Item	Specification																										
Connector type	25-way D-type, Female																										
Connector designation	SPI IN																										
Pin-outs	<table> <tbody> <tr> <td>Pin 1 — Clock (+)</td> <td>Pin 14 — Clock (–)</td> </tr> <tr> <td>Pin 2 — System Ground</td> <td>Pin 15 — System Ground</td> </tr> <tr> <td>Pin 3 — Data 7 (+)</td> <td>Pin 16 — Data 7 (–)</td> </tr> <tr> <td>Pin 4 — Data 6 (+)</td> <td>Pin 17 — Data 6 (–)</td> </tr> <tr> <td>Pin 5 — Data 5 (+)</td> <td>Pin 18 — Data 5 (–)</td> </tr> <tr> <td>Pin 6 — Data 4 (+)</td> <td>Pin 19 — Data 4 (–)</td> </tr> <tr> <td>Pin 7 — Data 3 (+)</td> <td>Pin 20 — Data 3 (–)</td> </tr> <tr> <td>Pin 8 — Data 2 (+)</td> <td>Pin 21 — Data 2 (–)</td> </tr> <tr> <td>Pin 9 — Data 1 (+)</td> <td>Pin 22 — Data 1 (–)</td> </tr> <tr> <td>Pin 10 — Data 0 (+)</td> <td>Pin 23 — Data 0 (–)</td> </tr> <tr> <td>Pin 11 — DVALID (+)</td> <td>Pin 24 — DVALID (–)</td> </tr> <tr> <td>Pin 12 — PSYNC (+)</td> <td>Pin 25 — PSYNC (–)</td> </tr> <tr> <td>Pin 13 — Cable Shield</td> <td></td> </tr> </tbody> </table>	Pin 1 — Clock (+)	Pin 14 — Clock (–)	Pin 2 — System Ground	Pin 15 — System Ground	Pin 3 — Data 7 (+)	Pin 16 — Data 7 (–)	Pin 4 — Data 6 (+)	Pin 17 — Data 6 (–)	Pin 5 — Data 5 (+)	Pin 18 — Data 5 (–)	Pin 6 — Data 4 (+)	Pin 19 — Data 4 (–)	Pin 7 — Data 3 (+)	Pin 20 — Data 3 (–)	Pin 8 — Data 2 (+)	Pin 21 — Data 2 (–)	Pin 9 — Data 1 (+)	Pin 22 — Data 1 (–)	Pin 10 — Data 0 (+)	Pin 23 — Data 0 (–)	Pin 11 — DVALID (+)	Pin 24 — DVALID (–)	Pin 12 — PSYNC (+)	Pin 25 — PSYNC (–)	Pin 13 — Cable Shield	
Pin 1 — Clock (+)	Pin 14 — Clock (–)																										
Pin 2 — System Ground	Pin 15 — System Ground																										
Pin 3 — Data 7 (+)	Pin 16 — Data 7 (–)																										
Pin 4 — Data 6 (+)	Pin 17 — Data 6 (–)																										
Pin 5 — Data 5 (+)	Pin 18 — Data 5 (–)																										
Pin 6 — Data 4 (+)	Pin 19 — Data 4 (–)																										
Pin 7 — Data 3 (+)	Pin 20 — Data 3 (–)																										
Pin 8 — Data 2 (+)	Pin 21 — Data 2 (–)																										
Pin 9 — Data 1 (+)	Pin 22 — Data 1 (–)																										
Pin 10 — Data 0 (+)	Pin 23 — Data 0 (–)																										
Pin 11 — DVALID (+)	Pin 24 — DVALID (–)																										
Pin 12 — PSYNC (+)	Pin 25 — PSYNC (–)																										
Pin 13 — Cable Shield																											

2.6 Powering Up/Down

2.6.1 General

Before powering up the equipment, confirm that the Modulator has been correctly installed by checking the following:

1. The Modulator enclosure has been installed in a suitable location.
2. Power supply range has been checked and the relevant fuse has been set at the rear panel power inlet connector, and a good earth has been provided.
3. The Modulator has been connected to other equipment and the control terminal, as required.

2.6.2 Powering Up

With the Modulator correctly installed, power up the unit as follows:

1. Power up the Modulator by turning on the local mains supply. The unit executes a series of power-up initialisation and self-test routines.
2. Ensure that all cooling fans are rotating. If they are not, switch off the equipment immediately.
3. Confirm that the front panel green Power LED is lit.
4. A warm-up period of 60 seconds (IF Output option) or 5 minutes (L-Band Output option) is required for the internal 10 MHz reference to meet specification. The Modulator is available for operation after performing self-tests.

2.6.3 Powering Down

Power down the Modulator as follows:

1. If required, disable the Modulator output by setting the IF Output state to Off at the relevant control terminal being used to configure the Modulator.
2. If required, remove the power supply connection at the rear of the unit.

Chapter 3

Operating the Equipment Locally

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3.1 Using Terminal Control

3.1.1 Introduction

CAUTION...

Only one logical control interface on the Modulator, i.e. Front Panel, Terminal, SNMP Remote Control, FTP, etc, should be used at any one time. Using more than one interface simultaneously may cause unexpected behaviour of the Modulator.

A VT100 terminal or a PC running the VT100 terminal emulation program may be used for control and monitoring of the Modulator, or terminal control can be used over a network using Telnet.

3.1.2 Setting up the VT100 Terminal Emulation Program

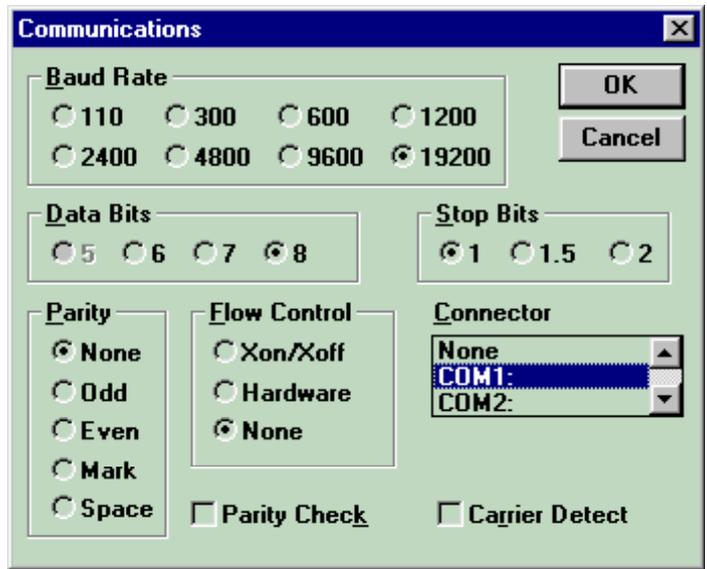
General

To use the VT100 terminal emulation program it is necessary to set the parameters first. Follow the instructions for the Windows 3.11 or Windows 95/98/NT 4.0 version, as appropriate.

Windows 3.11

To configure the parameters for the VT100 terminal emulation program using Windows 3.11, proceed as follows:

1. Open the Terminal program which is part of Windows 3.11.
2. Select the Settings menu and choose the Communications option (see *Figure 3.1*).



Required settings:

Baud Rate = 19200
Data Bits = 8
Stop Bits = 1
Parity = none
Flow Control = none

Set all others as required.

Figure 3.1: Communications Screen

3. Set the parameters as specified in *Figure 3.1*, then select the **Connector** port and click **OK**.
4. From the **Settings** menu, choose **Terminal Emulation** to display the Terminal Emulation dialog box (*Figure 3.2*).

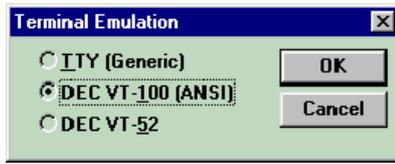
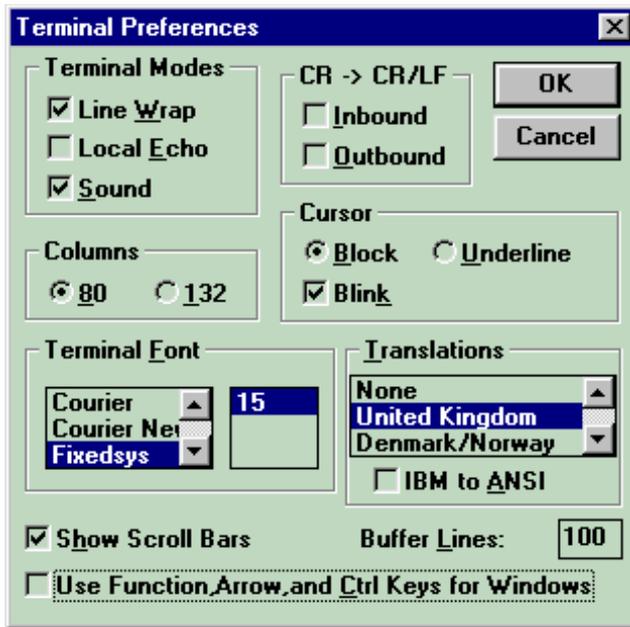


Figure 3.2: Terminal Emulation Dialog Box

5. Select **DEC VT-100 (ANSI)** and click **OK**.



Required settings:

Terminal Modes = Line Wrap
Columns = 80
Translations = UK

Set all others as required.

NOTE...

The Use Function, Arrow and Ctrl Keys for Windows selection **MUST** be disabled, i.e. no tick.

Figure 3.3: Terminal Preferences Dialog Box

6. From the **Settings** menu, choose **Terminal Preferences** (see *Figure 3.3*).
7. Set the parameters as in *Figure 3.3* and click **OK**.
8. From the **File** menu, choose **Save As...**
9. Save the set-up in a file.

The terminal emulation parameters are now set and do not require resetting unless the configuration has not been saved prior to exiting the program.

Windows 95/98/NT 4.0

Connecting the Terminal to the Modulator

To configure the parameters for the VT100 terminal emulation program using Windows 95/98/NT 4.0, proceed as follows:

1. Select the **Terminal** program by accessing it through **Start, Program, Accessories, HyperTerminal**.
2. Choose the icon and name for the terminal connection (see *Figure 3.4*) and click **OK**.

NOTE...

The name chosen in the example shown in *Figure 3.4* is SM5600 Terminal.

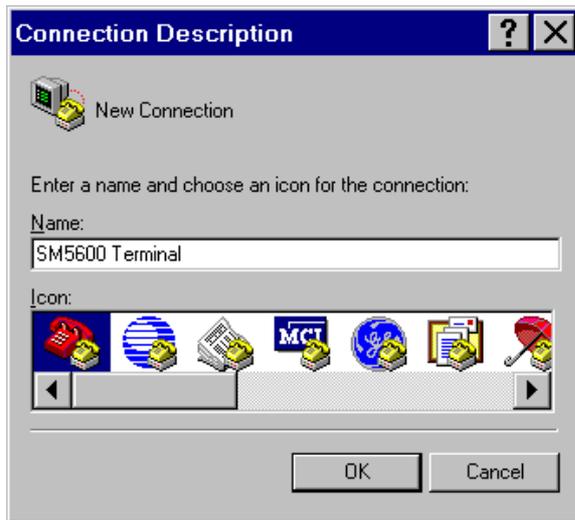


Figure 3.4: Connection Description Dialog Box

3. Choose the port to connect to (see *Figure 3.5*) and click **OK**.

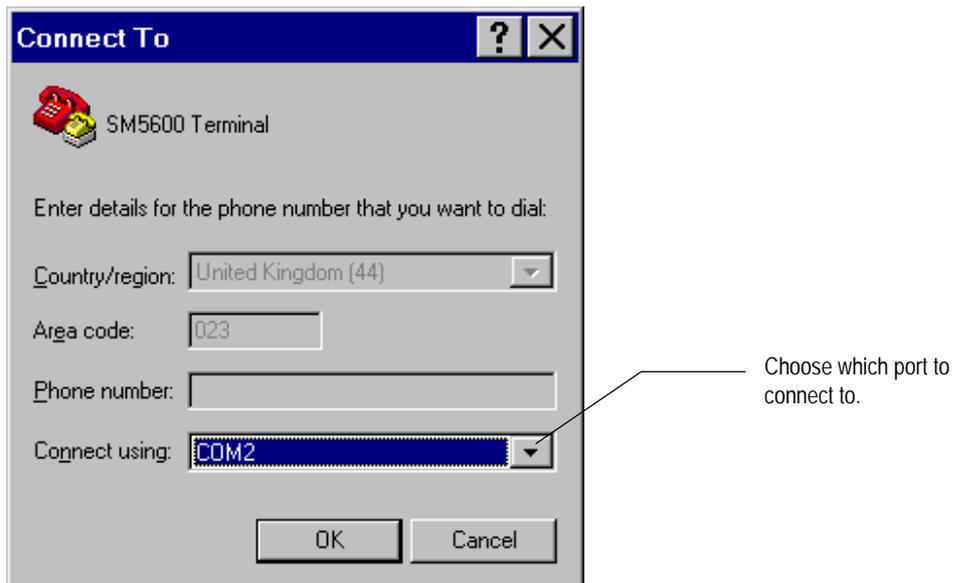


Figure 3.5: Connect To Dialog Box

4. Set the port parameters as specified in *Figure 3.6* and click **OK**.

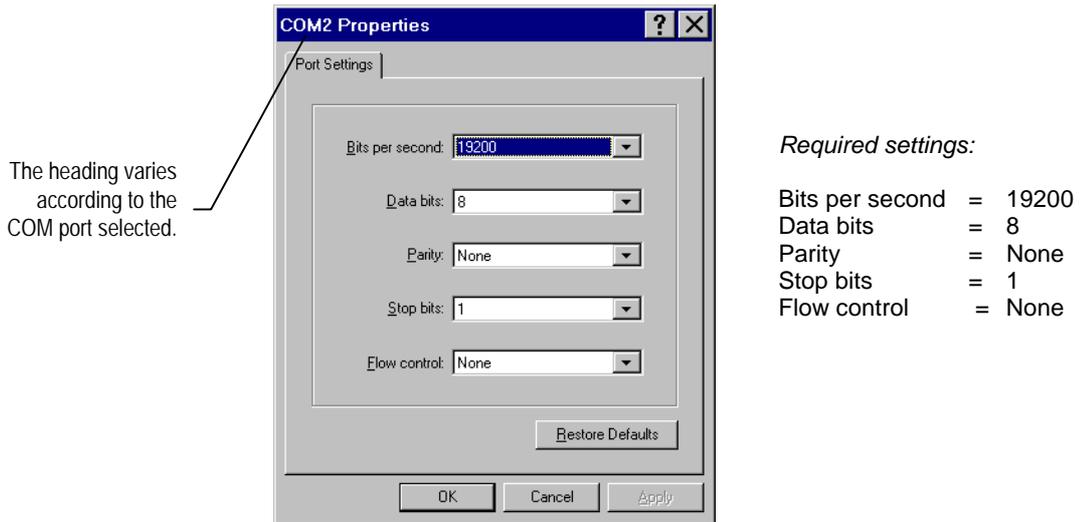


Figure 3.6: Port Properties Dialog Box

At this point, the terminal is connected to the Modulator.

Change the Terminal Properties

From **File** on the Windows menu bar, choose **Properties** if the terminal properties require changing. This displays the **Properties** dialog box. Select the **Settings** tab to display the dialog box shown in *Figure 3.7*.

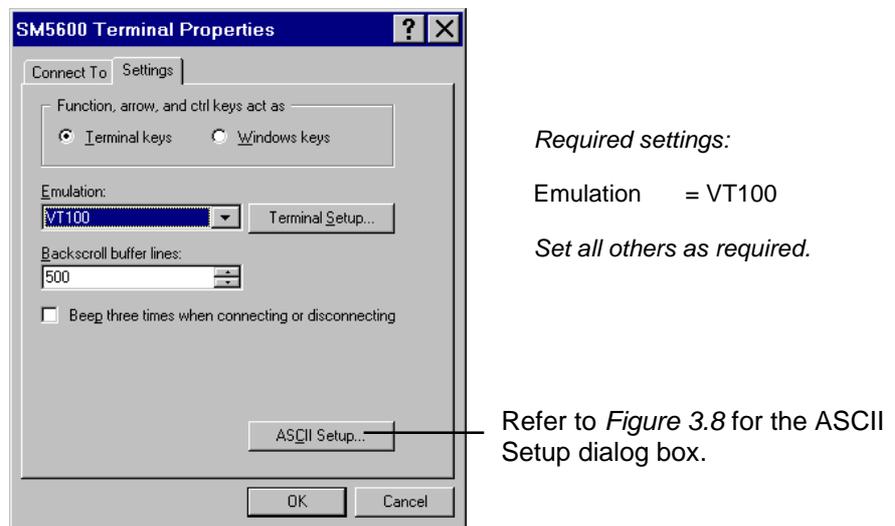
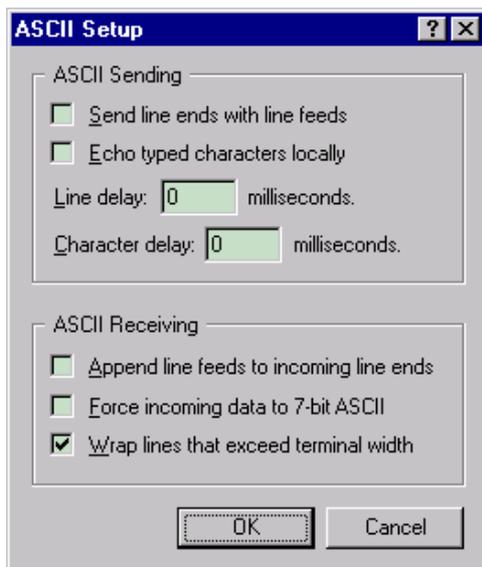


Figure 3.7: SM5600 Terminal Properties Dialog Box

If the ASCII settings require changing, click the **ASCII Setup** button on the **SM5600 Terminal Properties** dialog box. This displays the dialog box shown in *Figure 3.8*.



Required settings:

As shown in the ASCII Setup screen.

Figure 3.8: ASCII Setup Dialog Box

The terminal emulation parameters are now set and do not require resetting unless the configuration has not been saved prior to exiting the program.

Terminal Connection and Protocol

The Terminal control port is configured as a Data Terminal Equipment (DTE) communications port with the following specification:

- 19200 baud
- 8 data bits
- No parity
- 1 stop bit
- No flow control

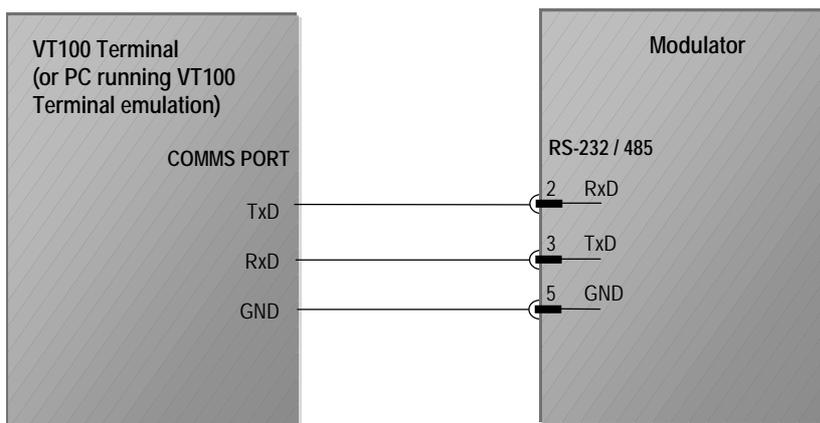


Figure 3.9: Local Terminal Connections

Establishing Control when the Modulator is in Terminal Mode

Set the Modulator to Terminal Mode via the Front Panel (see *Section 4.2.3*) or Telnet (see *Section 3.1.3*). To enable Terminal control using a local VT100 terminal perform the following:

- 1. Connect the terminal**
The terminal may be connected either before or after power-up of the Modulator. Connect the Local terminal to the RS-232/485 connector located near the right-hand side of the rear panel.
- 2. Boot**
At switch-on, a boot display appears. The Main Menu is then displayed, signifying that Terminal control has been established.

NOTE...
If the terminal is connected after power-up, press ENTER to activate Terminal control.

- 3. Configure parameters as required**
Previous configuration parameters are stored in Flash memory and restored on power-up. If a new configuration is required, choose the configuration parameters using the **Configuration** menu.

3.1.3 Setting Up Telnet

General

A Telnet program is supplied with Microsoft Windows and is used to control the Modulator.

To set up Telnet, perform the following:

1. From DOS, type **telnet <domain name server>** or **telnet <IP address>**.
2. Enter **root** for the user name, and **root** for the password.
3. To ensure correct communications, select the **Preferences** option from the **Terminal** menu and select the following parameters:

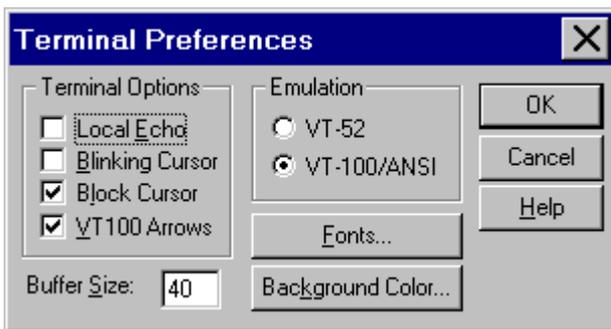


Figure 3.10: Telnet Terminal Preferences Dialog Box

CAUTION...
The Telnet program supplied with Microsoft Windows (Telnet Version 1.0) does not display bold characters which are used extensively to indicate the current selection.
Care should be taken when using this program.

Establishing Telnet Control

To connect to the Modulator using the Microsoft Telnet program, from the **Connect** menu, select **Remote System...**

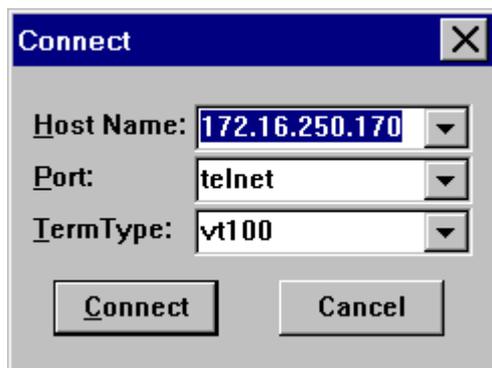


Figure 3.11: Telnet Connect Dialog Box

Enter the IP address of the Modulator and click **Connect**. A user name and password is necessary to gain access to the Modulator. Both the default user name and the default password are **root**.

NOTE...

The password for the root user may be changed by users with User Management privileges, see *Manage User Accounts* in *Section 3.7, System Menu* for details.

3.2 Navigating the Display Screens

3.2.1 Booting

At switch-on the Modulator runs through a boot sequence which may optionally include a series of self-tests. During this stage a boot display is visible on the local terminal (if the local serial port has been set to be a local terminal). The following display is via Telnet.

If the self-tests are successfully completed, the `Main Menu` is displayed.

If the tests are not successfully completed, one of various error messages may be displayed. See *Chapter 8, Preventive Maintenance and Fault-finding* for a list of the possible messages along with an explanation and any relevant remedial action.

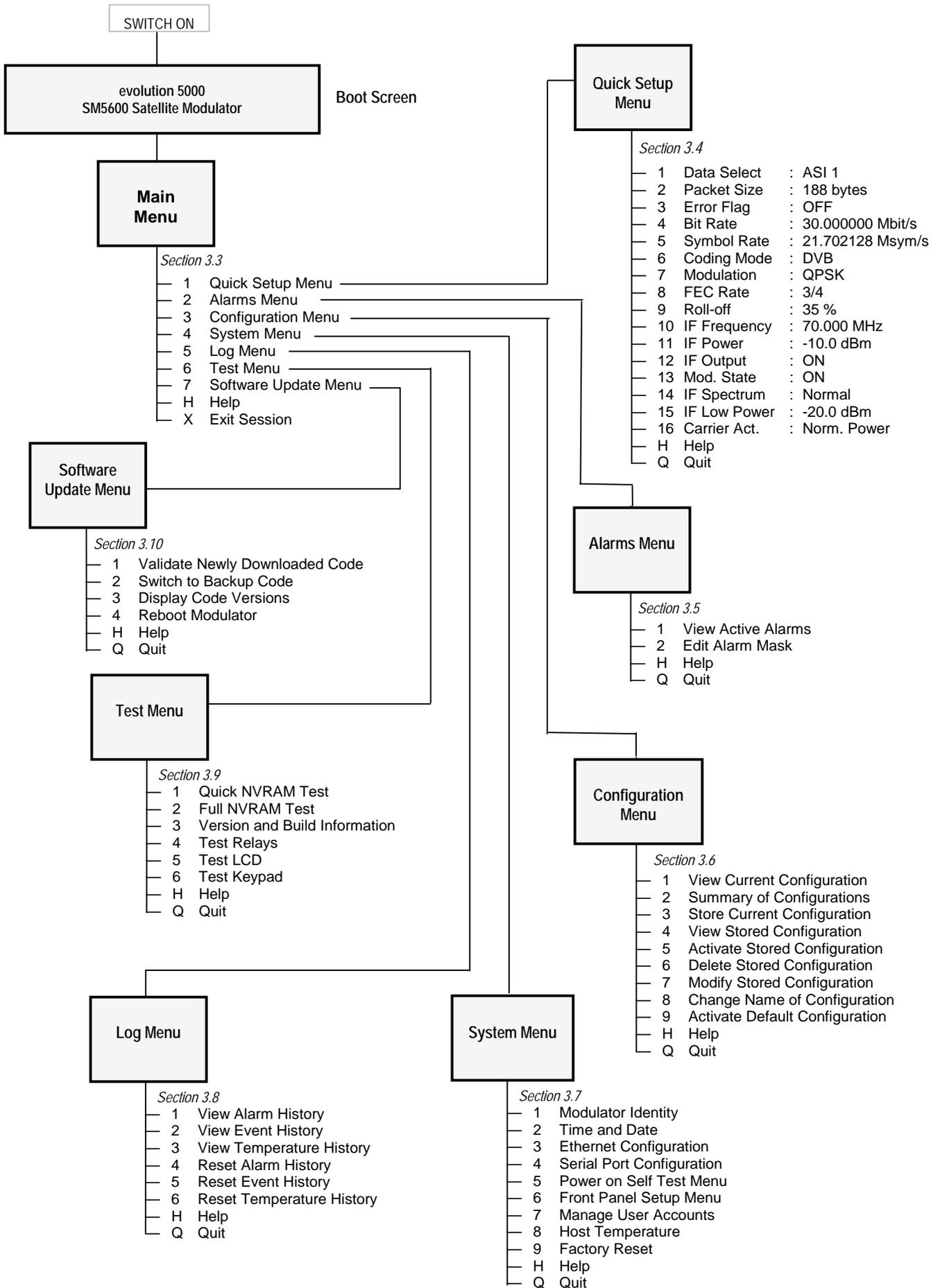
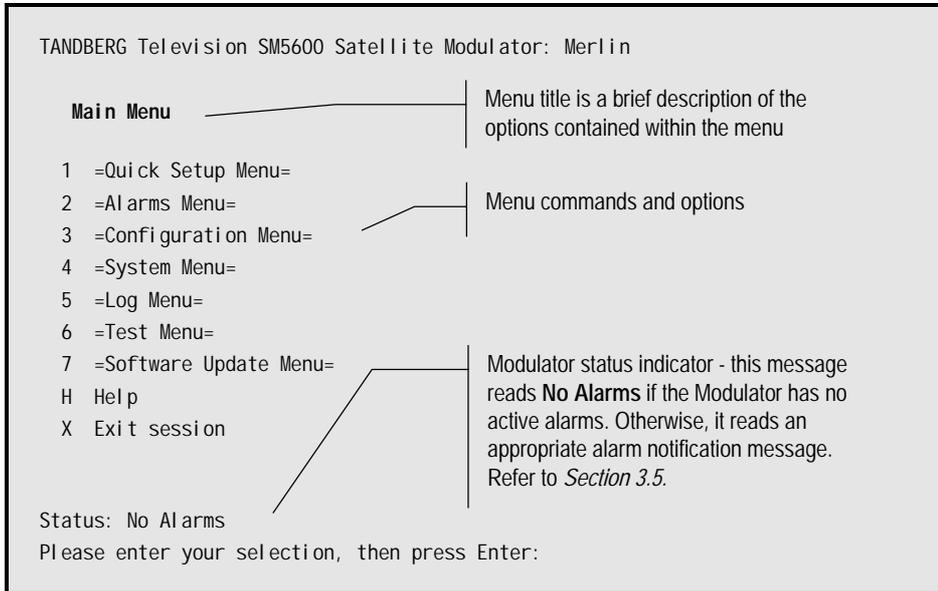


Figure 3.13: Menu Hierarchy

3.3 Main Menu

The Main Menu provides options for configuring and testing the Modulator. It also allows a password to be set to prevent access to the menu system. The Main Menu is automatically displayed immediately after the boot display screen. All menus conform to the format shown below.



Each of the options on this top-level menu provide access to further sub-menus (see the following headings).

- NOTES...**
1. Certain functionality of the Modulator is dependent upon which options have been purchased by the customer. Functionality is enabled or disabled by means of licence keys installed in the Modulator. The options available in some front panel and terminal menus are dependent upon which licence keys have been installed. See Chapter 10 for further information about licence keys.
 2. To ensure a valid output the message **Status: No Alarms** must be present and the Alarm LED must not be lit on the front panel.
 3. Menu options with an = sign on either side (eg =Test Menu=) indicate there are sub-menus.

3.4 Main Menu Option 1: Quick Setup Menu

3.4.1 Quick Setup Menu

Type **1** at the prompt to enter the Quick Setup Menu from the Main Menu. This menu provides the following options:

```

Quick Setup Menu

 1 Data Select : ASI 1           10 IF Frequency : 70.000 MHz
 2 Packet Size : 188 bytes      11 IF Power    : -10.0 dBm
 3 Error Flag  : OFF           12 IF Output   : ON
 4 Bit Rate   : 30.000000 Mbit/s 13 Mod. State  : ON
 5 Symbol Rate : 21.702128 Msym/s 14 IF Spectrum : Normal
 6 Coding Mode : DVB           15 IF Low Power : -20.0 dBm
 7 Modulation  : QPSK          16 Carrier Act. : Norm. Power
 8 FEC Rate    : 3/4           H Help
 9 Roll-off    : 35 %          Q Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
    
```

3.4.2 Quick Setup Menu Options

Quick Setup Menu Option 1: Data Select

```

Data Select : Current Value= "ASI 1"
 1   ASI 1
 2   ASI 2
 3   SPI
 4   Null Pkts
 5   PRBS
    
```

Quick Setup Menu Option 2: Packet Size

```

Packet Size : Current Value= "204 bytes"
 1   204 bytes
 2   188 bytes
    
```

Quick Setup Menu Option 3: Error Flag

When set to ON it sets the MPEG-2 transport stream error flag if input data is not present or contains invalid sync bytes.

```

Error Flag : Current Value= "OFF"
 1   OFF
 2   ON
    
```

Quick Setup Menu Option 4: Bit Rate

```
Bit Rate : Current Value= "30.000000" Mbit/s
Enter New Value 1.500000 to 72.000000 in Mbit/s,
or press Enter
```

Quick Setup Menu Option 5: Symbol Rate

```
Symbol Rate : Current Value= "21.702128" Msym/s
Enter New Value 1.000000 to 48.000000 in Msym/s,
or press Enter
```

Quick Setup Menu Option 6: Coding Mode

Used for future functionality.

```
Coding Mode : Current Value= "DVB"
1 DVB
```

Quick Setup Menu Option 7: Modulation

```
Modulation : Current Value= "QPSK"
1 BPSK
2 QPSK
3 *8PSK* FEC Rate : ->2/3
4 16QAM
```

NOTE...
In the above display, asterisks show that the currently set FEC rate is not valid for this modulation and 2/3 will be set automatically.

Quick Setup Menu Option 8: FEC Rate

The output data may be coded by the addition of convolutional Forward Error Correction (FEC) bits, enabling over-air errors which occur in the transmission process to be corrected at the receive end (see *Chapter 7, Equipment Description, Forward Error Correction and Interleaving* for further information).

Six FEC options are provided: a value of 1/2 gives the most protection but has the largest overhead on bit-rate, 8/9 gives the least protection but has the smallest overhead on bit-rate. The allowable values are dependent upon the Modulation currently selected.

FEC Rate	:	Current Value= "3/4"
1		1/2
2		2/3
3		3/4
4		5/6
5		7/8
6		*8/9* Modulation : ->8PSK

NOTE...
 In the above display, asterisks show that the currently set Modulation is not valid for this FEC rate and 8PSK will be set automatically.

Quick Setup Menu Option 9: Roll-off

Roll-off values from 20 to 35%. 35% is specified by DVB-S and DVB-DSNG; 25% is optionally specified by DVB-DSNG.

Roll-off	:	Current Value= "35" %
1		20%
2		25%
3		30%
4		35%

Quick Setup Menu Option 10: IF Frequency

This setting allows the centre frequency of the IF output to be changed. The allowable range is from 50 to 180 MHz for the IF Output option and 950 to 1750 MHz for the L-Band Output option.

IF Frequency:	Current Value= "70.000" MHz
	Enter New Value 50.000 to 180.000 in MHz,
	or press Enter

Quick Setup Menu Option 11: IF Power

IF Power value -20 to 5 dBm.

IF Power	:	Current Value= "-10.0" dBm
		Enter New Value -20.0 to 5.0 in dBm,
		or press Enter

Quick Setup Menu Option 12: IF Output

Output On or Off.

IF Output	:	Current Value= "ON"
1		OFF
2		ON

Quick Setup Menu Option 13: Mod. State

Modulation state On or Off.

```
Mod. State : Current Value= "ON"  
1      OFF  
2      ON
```

Quick Setup Menu Option 14: IF Spectrum

```
IF Spectrum : Current Value= "Normal"  
1      Normal  
2      Inverted
```

Quick Setup Menu Option 15: IF Low Power

Sets the IF Low Power value for use with Carrier Activation mode. Range is –20 to 5 dBm.

```
IF Low Power: Current Value= "-20.0" dBm  
Enter New Value -20.0 to 5.0 in dBm,  
or press Enter
```

Quick Setup Menu Option 16: Carrier Act

Carrier Activation mode determines what IF power level is set at boot and at configuration switchovers (not applicable following simple parameter changes). The selection may be set into one of three modes:

- Normal Power, where the configured power level is set immediately
- Low Power, where the IF output power is initially limited to IF Low Power
- IF Off, where the IF output power is initially held Off, until released

Release occurs when specifically selected, or during a current configuration parameter change. Carrier Activation is always assumed to be Normal Power for Remote Control.

```
Carrier Act : Current Value= "Norm. Power"  
1      Norm. Power  
2      Low Power  
3      IF OFF
```

Quick Setup Menu Option H: Help

Type **H** at the prompt to view information about the options on the Quick Setup Menu.

Quick Setup Menu Option Q: Quit

Type **Q** at the prompt to return to the Main Menu.

3.5 Main Menu Option 2: Alarms Menu

3.5.1 Alarms Menu

Type **2** at the prompt to enter the Alarms Menu from the Main Menu. This menu provides options for the following:

```

Alarms Menu

1 View Active Alarms
2 Edit Alarm Mask
H Help
Q Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
    
```

3.5.2 Alarms Menu Options

Alarms Menu Option 1: View Active Alarms

Lists all Currently Active Alarms in descending order of importance. See *Chapter 8, Section 8.9* for a list of possible Alarm Log entries.

```

View Active Alarms

01 CRITICAL Input Fail

Press Enter to continue
    
```

If no active alarms are present, the following screen is displayed.

```

View Active Alarms

--- No Alarms are Active ---

Press Enter to continue
    
```

Alarms Menu Option 2: Edit Alarm Mask

```

Edit Alarm Mask

1 OFF   Null Alarm           15 FAIL  Backplane not responding
2 ALARM Booting             16 FAIL  Baseband Card not Responding
3 ALARM Test Mode           17 FAIL  Input Card not Responding
4 FAIL  No Input Card        18 FAIL  Flat Battery
5 FAIL  No Baseband Card     19 FAIL  Flash Memory Program Fail
6 FAIL  No IF Card           20 FAIL  Self Test Fail
7 FAIL  3V3 PSU Voltage Low  21 ALARM Temperature Low
8 FAIL  3V3 PSU Voltage High 22 ALARM Temperature High
9 FAIL  5V PSU Voltage Low   23 FAIL  No Licence Keys Installed
10 FAIL 5V PSU Voltage High  24 ALARM Uplink Fade Control Error
11 FAIL +15V PSU Voltage Low  25 ALARM Input Fail
12 FAIL +15V PSU Voltage High 26 ALARM Input Packet Size Error
13 FAIL -15V PSU Voltage Low  27 FAIL  Hardware Fail
14 FAIL -15V PSU Voltage High  Q Next Block

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
    
```

Selecting any item displays the following menu. The display shows the screen after 13 (-15V PSU Voltage Low) has been selected.

```

Alarm: -15V PSU Voltage Low

1 Set Mask to "OFF"
2 Set Mask to "ALARM"
3 Set Mask to "FAIL"

Enter Selection:
    
```

Table 3.1: Mask Options

Setting	Description
OFF	The selected item is ignored.
ALARM	The selected item is designated as an alarm. When an item is designated as an alarm and is active, it actuates the alarm relay and the front panel Alarm LED. It also reports the alarm via the various interfaces.
FAIL	The selected item is designated as a fail. When an item is designated as a fail and is active, it actuates both the alarm and fail relays, and the front panel Alarm LED. It also reports the alarm via the various interfaces.

Alarms Menu Option H: Help

Type **H** at the prompt to view information about the options on the Alarms Menu.

Alarms Menu Option Q: Quit

Type **Q** at the prompt to return to the Main Menu.

3.6 Main Menu Option 3: Configuration Menu

3.6.1 Configuration Menu

Type **3** at the prompt to enter the Configuration Menu from the Main Menu. This menu provides options for selecting configuration and operating features.

```

Configuration Menu

1 View Current Configuration
2 Summary of Configurations
3 Store Current Configuration
4 View Stored Configuration
5 Activate Stored Configuration
6 Delete Stored Configuration
7 =Modify Stored Configuration=
8 Change Name of Configuration
9 Activate Default Configuration
H Help
Q Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
    
```

3.6.2 Configuration Menu Options

Configuration Menu Option 1: View Current Configuration

To select the View Current Configuration option from the Configuration Menu type **1** at the prompt. This option permits the viewing of the current configuration settings. The following illustrates a typical display.

NOTE...
The actual display depends upon the options fitted.

```

Config 0="" Main Config Menu <AnyUser>22 FEB 2001 16:22

1 Data Select : ASI 1          9 Roll-off      : 35 %
2 Packet Size : 188 bytes     10 IF Frequency: 70.000 MHz
3 Error Flag  : OFF          11 IF Power     : -10.0 dBm
4 Bit Rate   : 30.000000 Mbit/s 12 IF Output    : ON
5 Symbol Rate : 21.702128 Msym/s 13 Mod. State  : ON
6 Coding Mode : DVB           14 IF Spectrum : Normal
7 Modulation  : QPSK          Q Quit
8 FEC Rate    : 3/4

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
    
```

Configuration Menu Option 2: Summary of Configurations

To select the Summary of Configurations option from the Configuration Menu type **2** at the prompt. This displays the previously stored configurations.

```
Summary of Configurations

Config_0 Name="Current ", Author="AnyUser ", MAY 02 2002 13:05:47
Config_1 Name="First ", Author="system ", MAY 02 2002 13:05:47
Config_2 Name="Second ", Author="system ", MAY 02 2002 13:05:47
Config_3 Name="Thirdly ", Author="system ", MAY 02 2002 13:05:47
Config_4 Name="Fourth ", Author="system ", MAY 02 2002 13:05:47
Config_5 Name="Fifth ", Author="system ", MAY 02 2002 13:05:47
Config_6 Name="Sixth ", Author="system ", MAY 02 2002 13:05:47
Config_7 Name="Seventh ", Author="system ", MAY 02 2002 13:05:47
Config_8 Name="Eight Bel", Author="system ", MAY 02 2002 13:05:47
Config_9 Name="Default ", Author="system ", APR 26 2002 07:46:46
```

Configuration Menu Option 3: Store Current Configuration

To select the Store Current Configuration option from the Configuration Menu type **3** at the prompt. This allows the current configuration to be stored in the Flash memory.

Up to eight user configurations can be stored and later recalled without having to individually select the parameters each time. Enter the configuration number 0-8.

NOTE...
Configuration 0 is the currently active configuration, and Configuration 9 is the factory default (read only) configuration.

```
Store Current Configuration

Config_0 Name="Current ", Author="AnyUser ", MAY 02 2002 13:05:47
Config_1 Name="First ", Author="system ", MAY 02 2002 13:05:47
Config_2 Name="Second ", Author="system ", MAY 02 2002 13:05:47
Config_3 Name="Thirdly ", Author="system ", MAY 02 2002 13:05:47
Config_4 Name="Fourth ", Author="system ", MAY 02 2002 13:05:47
Config_5 Name="Fifth ", Author="system ", MAY 02 2002 13:05:47
Config_6 Name="Sixth ", Author="system ", MAY 02 2002 13:05:47
Config_7 Name="Seventh ", Author="system ", MAY 02 2002 13:05:47
Config_8 Name="Eight Bel", Author="system ", MAY 02 2002 13:05:47
Config_9 Name="Default ", Author="system ", APR 26 2002 07:46:46

Copy Current Configuration as Stored Config
Enter Config Number 0-8 ...
```

Configuration Menu Option 4: View Stored Configuration

To select the View Stored Configuration option from the Configuration Menu type **4** at the prompt. This allows the viewing of any of the previously stored configurations. Enter configuration number 0-9.

```
View Stored Configuration

Config_0 Name="Current ", Author="AnyUser ", MAY 02 2002 13:05:47
Config_1 Name="First ", Author="system ", MAY 02 2002 13:05:47
Config_2 Name="Second ", Author="system ", MAY 02 2002 13:05:47
Config_3 Name="Thirdly ", Author="system ", MAY 02 2002 13:05:47
Config_4 Name="Fourth ", Author="system ", MAY 02 2002 13:05:47
Config_5 Name="Fifth ", Author="system ", MAY 02 2002 13:05:47
Config_6 Name="Sixth ", Author="system ", MAY 02 2002 13:05:47
Config_7 Name="Seventh ", Author="system ", MAY 02 2002 13:05:47
Config_8 Name="Eight Bel", Author="system ", MAY 02 2002 13:05:47
Config_9 Name="Default ", Author="system ", APR 26 2002 07:46:46

View Stored Config
Enter Config Number 0-9...
```

Configuration Menu Option 5: Activate Stored Configuration

To select the Activate Stored Configuration option from the Configuration Menu type **5** at the prompt. This allows any of the previously stored configurations to be activated.

```
Activate Stored Configuration

Config_0 Name="Current ", Author="AnyUser ", MAY 02 2002 13:05:47
Config_1 Name="First ", Author="system ", MAY 02 2002 13:05:47
Config_2 Name="Second ", Author="system ", MAY 02 2002 13:05:47
Config_3 Name="Thirdly ", Author="system ", MAY 02 2002 13:05:47
Config_4 Name="Fourth ", Author="system ", MAY 02 2002 13:05:47
Config_5 Name="Fifth ", Author="system ", MAY 02 2002 13:05:47
Config_6 Name="Sixth ", Author="system ", MAY 02 2002 13:05:47
Config_7 Name="Seventh ", Author="system ", MAY 02 2002 13:05:47
Config_8 Name="Eight Bel", Author="system ", MAY 02 2002 13:05:47
Config_9 Name="Default ", Author="system ", APR 26 2002 07:46:46

Select Stored Config to Activate
Enter Config Number 0-9...
```

Select the number of the configuration to be activated (1-9). When this is done the Modulator loads it and configures to the specified parameters.

Configuration Menu Option 6: Delete Stored Configuration

To select the Delete Stored Configuration option from the Configuration Menu type **6** at the prompt. This allows any of the previously stored configurations to be deleted. Select the number of the configuration to be deleted (1-8).

```
Delete Stored Configuration

Config_0 Name="Current ", Author="AnyUser ", MAY 02 2002 13:05:47
Config_1 Name="First ", Author="system ", MAY 02 2002 13:05:47
Config_2 Name="Second ", Author="system ", MAY 02 2002 13:05:47
Config_3 Name="Thirdly ", Author="system ", MAY 02 2002 13:05:47
Config_4 Name="Fourth ", Author="system ", MAY 02 2002 13:05:47
Config_5 Name="Fifth ", Author="system ", MAY 02 2002 13:05:47
Config_6 Name="Sixth ", Author="system ", MAY 02 2002 13:05:47
Config_7 Name="Seventh ", Author="system ", MAY 02 2002 13:05:47
Config_8 Name="Eight Bel", Author="system ", MAY 02 2002 13:05:47
Config_9 Name="Default ", Author="system ", APR 26 2002 07:46:46

--= To Skip deletion of any Configuration, Press <CR> only ==
Select Stored Config to Delete
Enter Config Number 1-8...
```

Configuration Menu Option 7: Modify Stored Configuration

To select the Modify Stored Configuration option from the Configuration Menu type **7** at the prompt. This allows any of the previously stored user configurations to be modified. Select the number of the configuration to be modified (1-8).

```
=Modify Stored Configuration=

Config_0 Name="Current ", Author="AnyUser ", MAY 02 2002 13:05:47
Config_1 Name="First ", Author="system ", MAY 02 2002 13:05:47
Config_2 Name="Second ", Author="system ", MAY 02 2002 13:05:47
Config_3 Name="Thirdly ", Author="system ", MAY 02 2002 13:05:47
Config_4 Name="Fourth ", Author="system ", MAY 02 2002 13:05:47
Config_5 Name="Fifth ", Author="system ", MAY 02 2002 13:05:47
Config_6 Name="Sixth ", Author="system ", MAY 02 2002 13:05:47
Config_7 Name="Seventh ", Author="system ", MAY 02 2002 13:05:47
Config_8 Name="Eight Bel", Author="system ", MAY 02 2002 13:05:47
Config_9 Name="Default ", Author="system ", APR 26 2002 07:46:46

Select Stored Config to be Modified
Enter Config Number 1-8...
```

Configuration Menu Option 8: Change Name of Configuration

To select the Change Name of Configuration option from the Configuration Menu type **8** at the prompt. This allows the name of any of the previously stored configurations to be changed. Select the number of the configuration to be changed (1-8).

```
Change Name of Configuration

Config_0 Name="Current ", Author="AnyUser ", MAY 02 2002 13:05:47
Config_1 Name="First ", Author="system ", MAY 02 2002 13:05:47
Config_2 Name="Second ", Author="system ", MAY 02 2002 13:05:47
Config_3 Name="Thirdly ", Author="system ", MAY 02 2002 13:05:47
Config_4 Name="Fourth ", Author="system ", MAY 02 2002 13:05:47
Config_5 Name="Fifth ", Author="system ", MAY 02 2002 13:05:47
Config_6 Name="Sixth ", Author="system ", MAY 02 2002 13:05:47
Config_7 Name="Seventh ", Author="system ", MAY 02 2002 13:05:47
Config_8 Name="Eight Bel", Author="system ", MAY 02 2002 13:05:47
Config_9 Name="Default ", Author="system ", APR 26 2002 07:46:46

Select Config requiring "Name" change ...
```

Configuration Menu Option 9: Activate Default Configuration

To select the Activate Default Configuration option from the Configuration Menu type **9** at the prompt. This activates the factory default configuration.

```
Activate Default Configuration

Defaults have been set.
Press <CR> ...
```

Configuration Menu Option H: Help

Type **H** at the prompt to view information about the options on the Configuration Menu.

Configuration Menu Option Q: Quit

Type **Q** at the prompt to return to the Main Menu.

3.7 Main Menu Option 4: System Menu

3.7.1 System Menu

Type **4** at the prompt to enter the `System Menu` from the `Main Menu`. This allows system configuration parameters to be set.

```
System Menu

 1 Modulator Identity
 2 =Time and Date=
 3 =Ethernet Configuration=
 4 =Serial Port Configuration=
 5 =Power-on Self Test Menu=
 6 =Front Panel Setup Menu=
 7 Manage User Accounts
 8 Host Temperature
 9 =Factory Reset=
 H Help
 0 Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
```

3.7.2 System Menu Options

System Menu Option 1: Modulator Identity

Changing the Modulator Identity

To check, display, or edit the current Modulator identity name.

```
Modulator Identity

The current identity is: Merlin

Enter new identity, or press return to keep the same identity:
```

In this example, the current identity is **Merlin**. To change the identity, type in the new one and press ENTER. It may be up to 49 characters in length. If no change is required, press ENTER.

Accepting the Current Modulator Identity

When the ENTER key is pressed without entering a new identity, the following screen is displayed. Press ENTER to redisplay to return to the System Menu.

```
Identity not updated

Press Enter to continue
```

System Menu Option 2: Time and Date

Overview

To select the Time and Date Menu from the System Menu type **2** at the prompt. This allows the current time and date settings to be viewed or set. Also allows a network time and date source to be specified. The time and date is used by the Modulator in its event and alarm logs.

```
Time and Date Menu

  1 Display Current Time and Date
  2 Set Time and Date
  3 Setup Network Time Server
  4 Date Format
  H Help
  Q Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
```

Time and Date Option 1: Display Current Time and Date

Type **1** at the prompt to display the Display Current Time and Date screen from the Time and Date Menu.

```
Display Current Time and Date

[Initiated: APR 26 2002 07:46:17]    [Booted May 03 2002 13:14:32]

The current time is: Friday May 3 2002 15:37:24

Press Enter to continue
```

Time and Date Option 2: Set Time and Date

Type **2** at the prompt to select the Set Time and Date option from the Time and Date Menu.

Time and Date Option 2: Set Time and Date - Setting the Time From the Network

When the time server has been set up and enabled, the time can be downloaded from the network. To select this type **Y** against the Get time from network?(Y/N) option.

```
Set Time and Date

Get time from network?(Y/N)          - Y Chosen
Got time: 19 Jun 2000 08:24:10 441ms
```

When the server time is not available, the following screen is displayed.

```
Failed to get the time from the network.  
  
Press Enter to continue
```

Press ENTER to return to the Time and Date Menu.

Time and Date Option 2: Set Time and Date - Setting the Time Locally

If the time is not from the network, the time and date must be entered manually using the following screen. To select this type **N** against the Get time from network?(Y/N) option.

```
Set Time and Date  
  
Get time from network?(Y/N)                - N Chosen  
The current time is: Thursday May 2 2002 13:43:53  
Enter Hours (0 - 23): 13 -  
Enter Minutes (0 - 59): 43 -  
Enter Seconds (0 - 59): 53 -  
Enter Date (1 - 31): 2 -  
Enter Month (1 - 12): 5 -  
Enter Year: 2002 -  
Enter Day (1 - 7, 1 = Sunday): Thursday -  
Date and time updated
```

Time and Date Option 3: Setup Network Time Server

Type **3** at the prompt to view the Setup Network Time Server menu from the Time and Date Menu. This menu allows a network time server to be configured.

```
Setup Network Time Server  
  
Current time server IP address = 255.255.255.255  
Do you want to change it (Y/N)?:
```

Time and Date Option 3: Setup Network Time Server - Changing the IP Address

Type **Y** at the previous screen to display the following. This allows another server to be specified.

```
Enter time server IP address: 192.168.7.248 - New IP address entered  
Time server IP address updated.  
Current time server protocol - SNTP  
Do you want to change it (Y/N)?                Type Y to change the protocol
```

Time and Date Option 3: Setup Network Time Server - Changing the Time Protocol

The Modulator supports both the **Time** and **SNTP** (Simple Network Time) protocols. Once enabled, the Modulator updates its internal time every 15 minutes.

```
Enter 1 for Time protocol , 2 for SNTP:2
Time server port updated.
Use of the time server (192.168.7.248) is currently ENABLED.
```

Time and Date Option 4: Date Format

The Modulator supports a number of date formats. Use this option to make a selection.

```
          Date Format

Current Date Format = mm/dd/yyyy
1  mm/dd/yyyy
2  dd/mm/yyyy
3  yyyy/mm/dd

Please enter your selection, then press Enter:
```

System Menu Option 3: Ethernet Configuration

Overview

Type **3** at the prompt to view the Ethernet Configuration Menu from the System Menu. This menu allows the configuration of the Ethernet interface.

```
Ethernet Configuration Menu

1 Display Current Settings
2 Modify IP Address
3 Modify Subnet Mask
4 Modify Gateway IP Address
5 Display Ethernet Port Usage
6 SNMP Setup
H Help
Q Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
```

Ethernet Configuration Option 1: Display Current Settings

Type **1** at the prompt to view the Display Current Settings screen from the Ethernet Configuration Menu. It displays the current settings.

```
Display Current Settings

IP Address      : 172.16.248.136
Subnet mask    : 255.255.0.0
Gateway IP     : 172.16.254.254
Gateway        : Enabled
MAC Address    : 00:20:AA:09:00:06
Time Server IP : 192.168.7.248
Time Protocol  : SNTP
Time Server    : Disabled
SNMP Mode      : Monitoring only

Press Enter to continue
```

Ethernet Configuration Option 2: Modify IP Address

Type **2** at the prompt to view the Modify IP Address menu from the Ethernet Configuration Menu. It displays the current settings. This menu allows the IP address to be changed:

```
Modify IP Address

Changing the IP address will terminate this network connection
Current IP Address = 172.16.248.136
Do you want to change it (Y/N)?: - Y Pressed

Enter the new IP address: 172.16.250.180
IP address updated
```

Ethernet Configuration Option 3: Modify Subnet Mask

Type **3** at the prompt to view the Modify Subnet Mask menu from the Ethernet Configuration Menu. It displays the current settings and allows the subnet mask to be updated:

```
Modify Subnet Mask

Changing the Subnet mask may terminate this network connection

Current Subnet mask = 255.255.0.0
Do you want to change it (Y/N)?: - N Pressed

Subnet mask not updated
```

Ethernet Configuration Option 4: Modify Gateway IP Address

Type **4** at the prompt to view the Modify Gateway IP Address menu from the Ethernet Configuration Menu. It displays the current settings. This screen allows the Gateway IP address to be modified:

```

Modify Gateway IP Address

Changing the gateway settings may terminate this network connection

Current gateway address = 172.16.254.254
Do you want to change it (Y/N)?:                - N Pressed
Gateway address not updated
The use of the gateway is currently:Enabled

Do you want to change it (Y/N)?                - Y Pressed
Gateway disabled.
    
```

If Y is typed as the response to changing the gateway address, the following screen is displayed.

```

Do you want to change it (Y/N)?:                - Y Pressed
Enter the new gateway IP address: 172.16.254.254 -
Gateway address updated
Network reconfigured
The use of the gateway is currently:Enabled
Do you want to change it (Y/N)?:
    
```

Ethernet Configuration Option 5: Display Ethernet Port Usage

Type **5** at the prompt to view the Display Ethernet Port Usage screen from the Ethernet Configuration Menu. It displays the status of the two Ethernet connectors on the rear panel.

```

Display Ethernet Port Usage

+-----+
\
/
\      ^  ^      +-----+
/      |  |  |  |  0|          |0
\      v  v      +-----+
/
\
/      +-----+ +-----+
\      | LIVE | | | | +-----+ +-----+
/ 0    | IN USE| | | | 0|          |0 0|          |0
\      ++  ++  ++  ++  +-----+ +-----+
/      +-----+ +-----+
\      1          2          RS-232/485  Reset/Status
/      Ethernet
+-----+

Press Enter to continue
    
```

Table 3.2: Display Ethernet Port Usage Menu

Command	Description
LIVE	There is a cable plugged in which is connected to a network
IN USE	The Modulator is using data from this connector

It is possible for both links to be **live** but only one will be in use at any one time.

Ethernet Configuration Option 6: SNMP Setup

Type **6** at the prompt to view the `SNMP Setup` menu from the `Ethernet Configuration` Menu. It displays the current settings and displays the status.

```

SNMP Setup Menu

1 Display Current Settings
2 Set SNMP to Monitoring Only
3 Set SNMP to Full Control
4 Set SNMP alarm text mode to Verbose
5 Set SNMP alarm text mode to Terse
H Help
Q Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
    
```

Table 3.3: SNMP Setup Menu

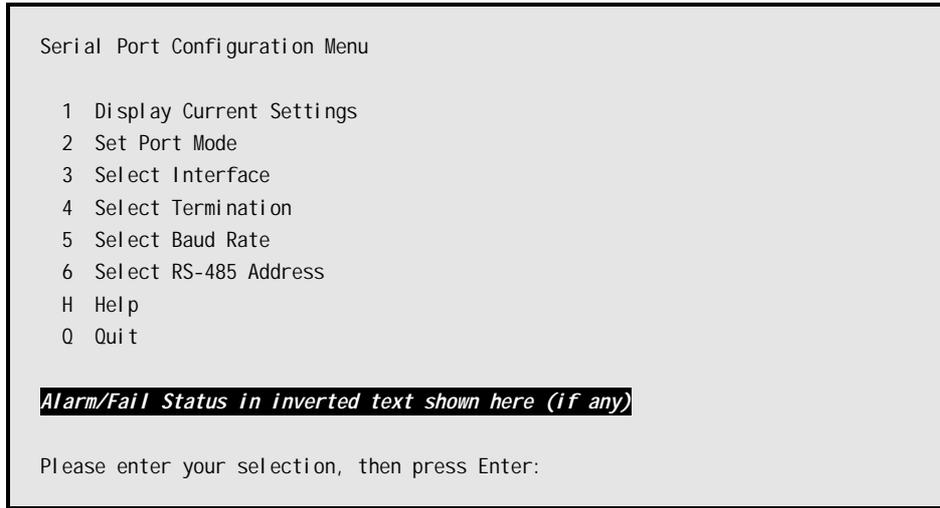
Command	Messages
1 Display Current Settings	The SNMP mode is set to Monitor Only. The SNMP alarm text mode is set to Terse.
2 Set SNMP to Monitoring Only	SNMP mode updated. Already set to monitor only mode.
3 Set SNMP to Full Control	SNMP mode updated. Already set to full control mode.
4 Set SNMP alarm text mode to Verbose	SNMP verbose alarm text mode updated. Already set to verbose alarm text mode.
5 Set SNMP alarm text mode to Terse	SNMP terse alarm text mode updated. Already set to terse alarm text mode.

System Menu Option 4: Serial Port Configuration

Serial Port Configuration

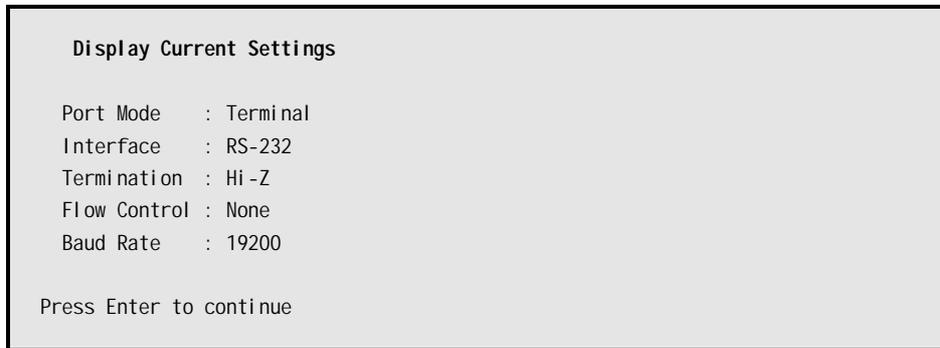
Type **4** at the prompt to view the `Serial Port Configuration` menu from the `System Menu`.

This menu displays the Serial (RS-232/485) port configuration settings and allows the port mode to be set.



Serial Port Configuration Option 1: Display Current Settings

Type **1** at the prompt to view the Display Current Settings screen from the Serial Port Configuration menu. It displays the current settings (the settings cannot be changed).



Serial Port Configuration Option 2: Set Port Mode

Type **2** at the prompt to view the Set Port Mode menu from the Serial Port Configuration menu. This option allows the serial port to be configured as a terminal or remote connection.

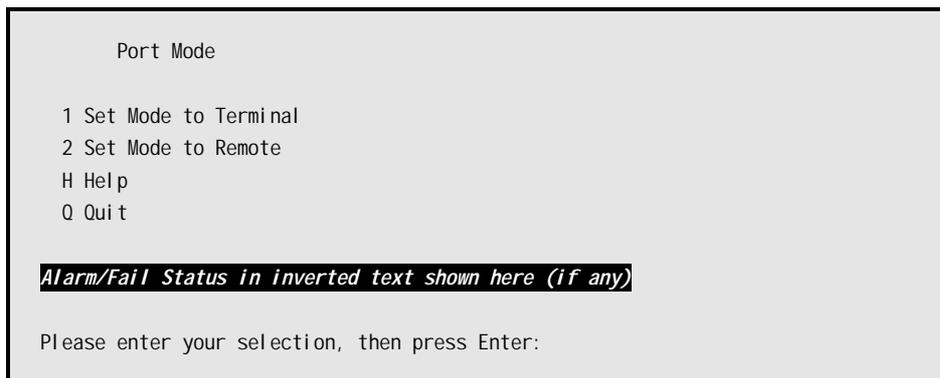


Table 3.4: Set Port Mode Options

Command	Options	Description
1	Set Mode to Terminal	Port mode updated. This change requires the modulator to be rebooted. Select this option to allow control of the Modulator by means of a VT100 terminal.
2	Set Mode to Remote	Port mode updated. This change requires the modulator to be rebooted. Select this option to allow the serial remote control protocol to be used via the RS-232/485 port. See <i>Chapter 5, RS-232 Remote Control Protocol</i> and <i>Chapter 6, RS-485 Remote Control Protocol</i> .

Serial Port Configuration Option 3: Select Interface

Type **3** at the prompt to view the `Select Interface` screen from the `Serial Port Configuration` menu. This option allows the port to be configured as either an RS-232 or RS-485 port.

```

Select Interface

Serial Port is configured as RS-232

1    RS-232
2    RS-485

Please enter your selection, then press Enter:
    
```

Serial Port Configuration Option 4: Select Termination – RS-232 Interface

Type **4** at the prompt to view the `Select Termination` screen from the `Serial Port Configuration` menu. When the RS-232 interface is selected, only the Hi-Z option is available.

```

Select Termination

Serial Port is terminated by Hi-Z

Cannot set termination in RS-232 Mode
Press Enter to continue
    
```

Serial Port Configuration Option 4: Select Termination – RS-485 Interface

Type **4** at the prompt to view the `Select Termination` screen from the `Serial Port Configuration` menu. Selecting **100 Ohms** switches in 100 Ω line termination resistors at the RS-485 line receiver inputs.

```

Select Termination

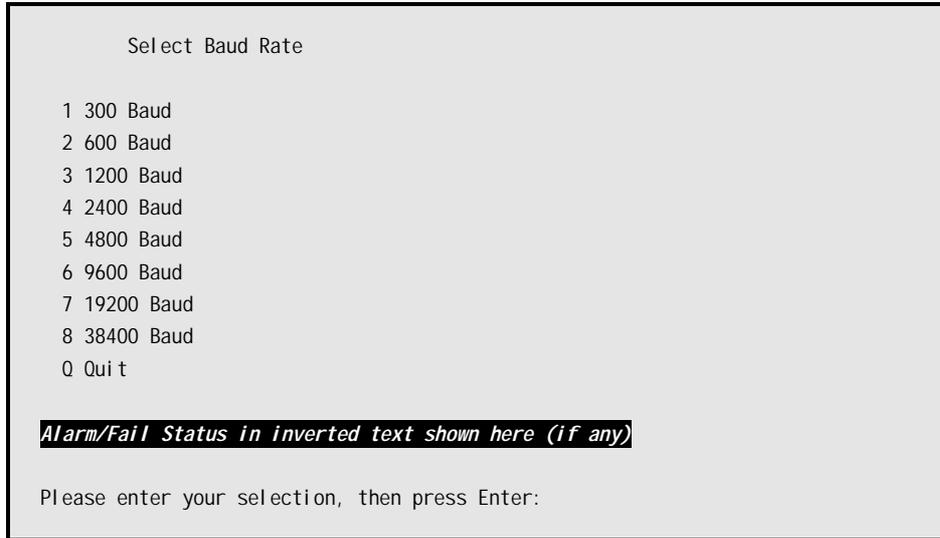
Serial Port is terminated by Hi-Z

1    Hi-Z
2    100 Ohms

Please enter your selection, then press Enter:
    
```

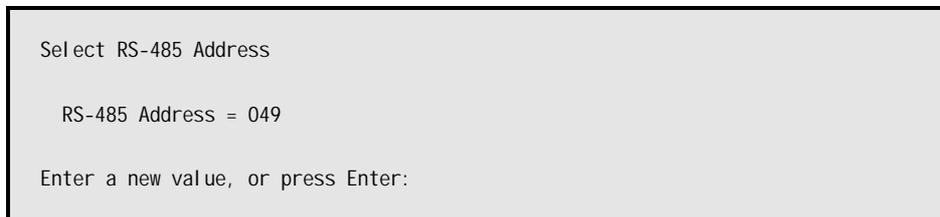
Serial Port Configuration Option 5: Select Baud Rate

Type **5** at the prompt to view the Select Baud Rate menu from the Serial Port Configuration menu. This option allows the speed of the RS-232/485 port to be set between 300 and 38400 Baud.



Serial Port Configuration Option 6: Select RS-485 Address

Type **6** at the prompt to view the Select RS-485 Address menu from the Serial Port Configuration menu. This option allows the RS-485 address to be configured. The address is used by the RS-485 Remote Control Protocol. See *Chapter 6, RS-485 Remote Control Protocol*.



System Menu Option 5: Power-on Self Test Menu

Power-on Self Test Menu

Type **5** at the prompt to view the Power-on Self Test Menu from the System Menu. This menu allows the self-test executed at power on to be bypassed.

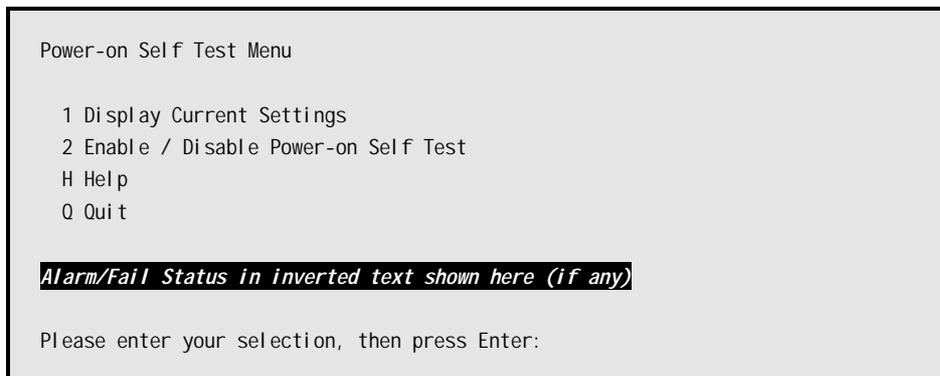


Table 3.5: Power-on Self Test Setup Menu

Command	Options	Description
1	Display Current Settings	Power-on self test is ENABLED. Power-on self test is DISABLED
2	Enable / Disable Power on Self Test	Do you want to ENABLE the power-on self test? Do you want to DISABLE the power-on self test?

System Menu Option 6: Front Panel Setup Menu

Type **6** at the prompt to view the Front Panel Setup Menu from the System Menu. This menu defines the access available from the front panel.

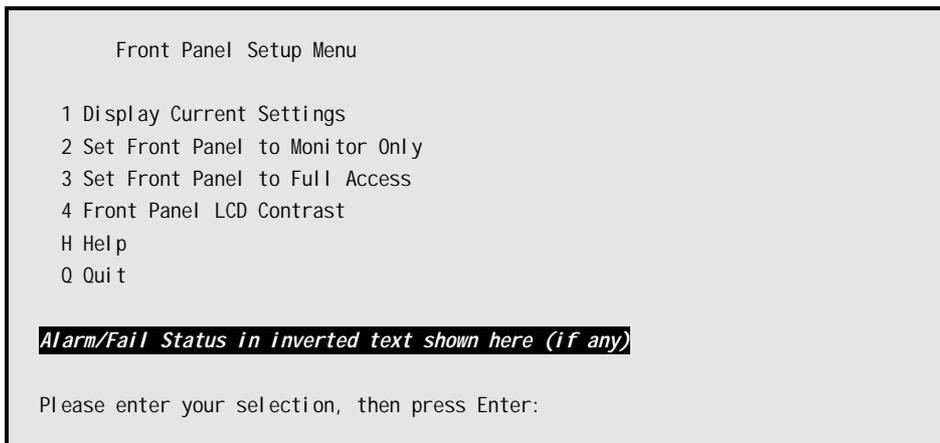


Table 3.6: Front Panel Setup Menu Options

Command	Options	Description
1	Display Current Settings	This screen displays the current settings.
2	Set Front Panel to Monitor Only	The front panel display is set to view only mode using this menu option. In this mode, all configuration information may be viewed, but no modifications to any settings are allowed.
3	Set Front Panel to Full Access	The front panel display is set to full access mode using this menu option. In this mode, the Modulator may be fully controlled.
4	Front Panel LCD Contrast	The front panel LCD contrast may be adjusted using this menu option.
	1 Contrast 1 (Min)	
	2 Contrast 2	
	3 Contrast 3	
	4 Contrast 4	
	5 Contrast 5 (Max)	
	Q Quit	

System Menu Option 7: Manage User Accounts Menu

Manage User Accounts Menu

To select the `Manage User Accounts` menu from the `System Menu` type **7** at the prompt. This menu allows user accounts to be created, modified or deleted, and restores all settings to the original manufactured state. When the `Manage User Accounts` menu item is selected, the user must log on:

```

Manage User Accounts

Logon to user manager...
Enter manager name:
    
```

Access to the `User Accounts` Menu is only available to users with `User Management` privileges. Once logged on the following menu is displayed:

```

User Accounts Menu

1 Add User
2 Remove User
3 Change User Password
4 Change User Access Privileges
5 List User Accounts
H Help
Q Quit
    
```

Table 3.7: User Accounts Menu Options

Command	Options	Description
1 Add User	Enter new user name:test Enter new user password:***** Re-enter password:*****	This option allows users to be added to the system. There is a maximum of 10 user accounts.
2 Remove User	Enter user name:test	This option allows a user account to be removed.
3 Change User Password	Enter existing user name:test Enter new password:***** Re-enter password:*****	It allows the password of a user to be changed. Only a user manager can change passwords.
4 Change User Access Privileges		See Figure 3.14 and Figure 3.15
5 List User Accounts		See Figure 3.16

User Accounts Option 4: Change User Access Rights – New Account

This menu is shown for a new account. All possible privileges are shown as **Add** indicating that the user currently does not have them.

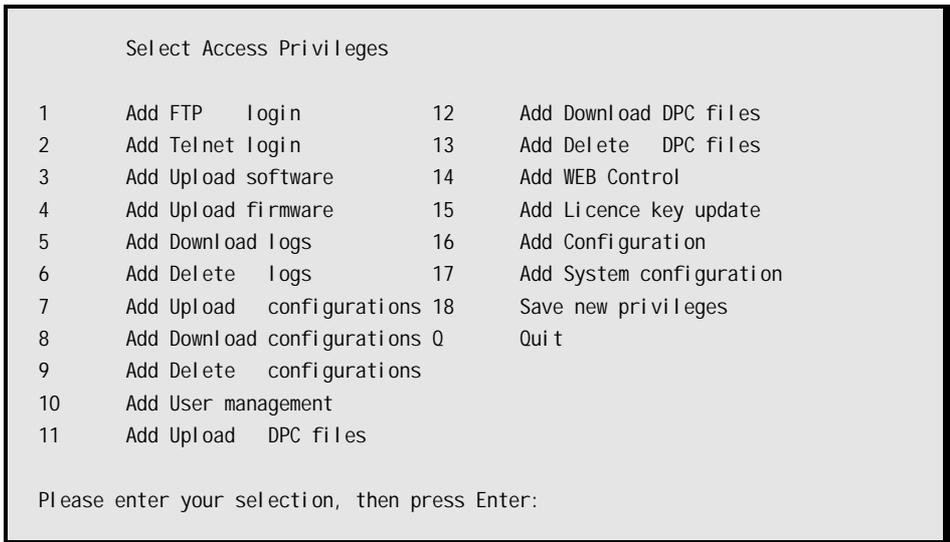


Figure 3.14: User Accounts Option 4: Change User Access Rights – New Account

User Accounts Option 4: Change User Access Rights – Changing User Rights

To add the right to login via Telnet, type **2**. This displays the screen shown in Figure 3.15.

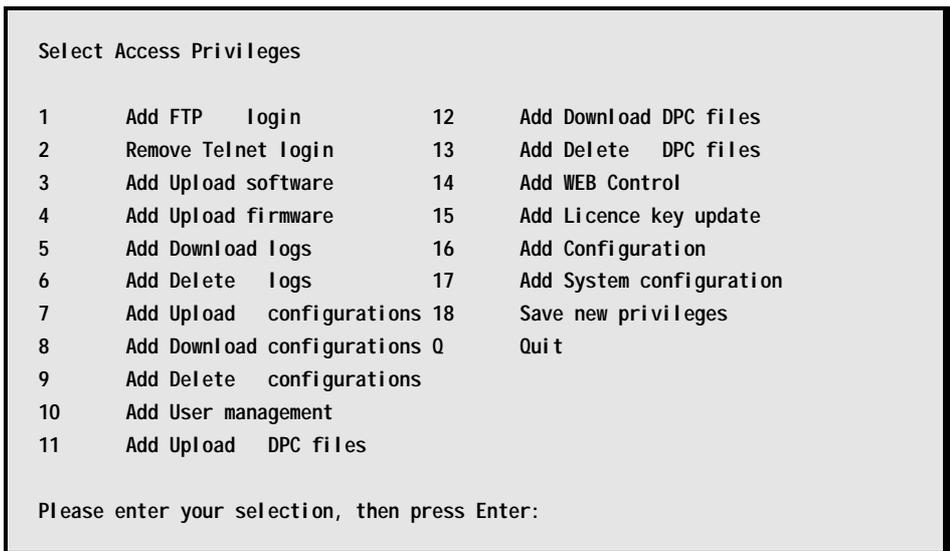


Figure 3.15: User Management Option 4: Change User Access Rights – Changing Rights

The Telnet login is now listed as **Remove**, indicating that the privilege has been assigned. Repeat until all privileges that are required have been selected, then type **18** to save new privileges and update the account.

User Accounts Option 5: List User Accounts

To select the List User Accounts screen from the User Accounts Menu type **5** at the prompt. This screen shown in Figure 3.16 displays the current accounts and their access privileges (described in Table 3.8).

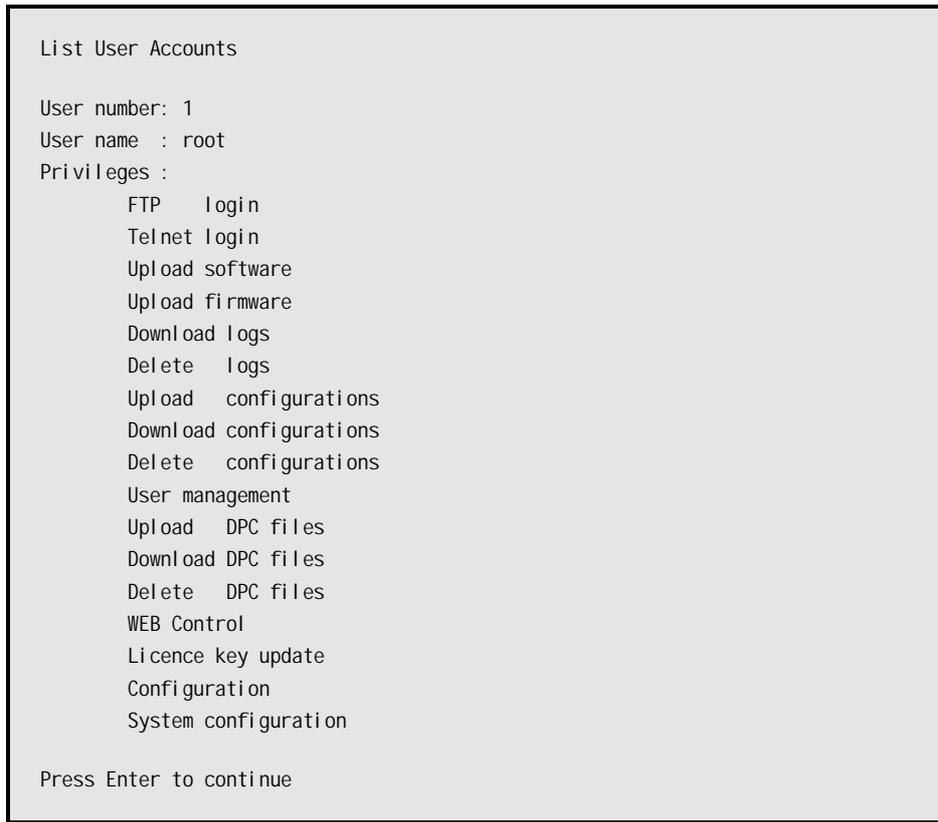


Figure 3.16: List User Accounts Display

There is always a **root** account. The root account has all access rights, and has a default password of **root**. The password may be changed, but the access rights may not be altered. The root account can not be deleted; however, if the password has been changed, deleting the account will reset the password to the default.

Table 3.8: User Account Privileges

Privilege	Description
FTP login:	User can login via FTP
Telnet login:	User can login via Telnet
Upload software:	User can update the Modulator software (FTP access required)
Upload firmware:	User can update the Modulator firmware (FTP access required)
Download logs:	User can download Modulator log files (FTP access required)
Delete logs:	User can delete Modulator log files (FTP access required)
Upload configurations:	User can upload configuration files (FTP access required)
Download configurations:	User can download configuration files (FTP access required)
Delete configurations:	User can delete configuration files (FTP access required)
User management:	User can perform user management functions
Upload DPC files:	User can upload pre-corrector files (FTP access required)
Download DPC files:	User can download pre-corrector files (FTP access required)
Delete DPC files:	User can delete pre-corrector files (FTP access required)
WEB Control:	User can modify the configuration via the web interface
Licence key update:	User can update licence key files (FTP access required)
Configuration:	
System configuration:	

NOTE...
 Information on FTP access is given in *Chapter 9, File Transfer Protocol (FTP)*.

System Menu Option 8: Host Temperature

To select the `Host Temperature` option from the `System Menu` type **8** at the prompt. This displays the latest temperature value at the Host Controller Card (which takes up to ten seconds).

```
Host Temperature

Press Enter to refresh reading or any other key to continue
Host Temperature is 27.000000 deg C
```

System Menu Option 9: Factory Reset

To select the `Factory Reset` menu from the `System Menu` type **9** at the prompt. It allows the user to reset system data.

```
Factory Reset Menu

1 Reset System Data Only
2 Reset All DPC Transponder Profiles
3 Reset All Except Networking Data
H Help
Q Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
```

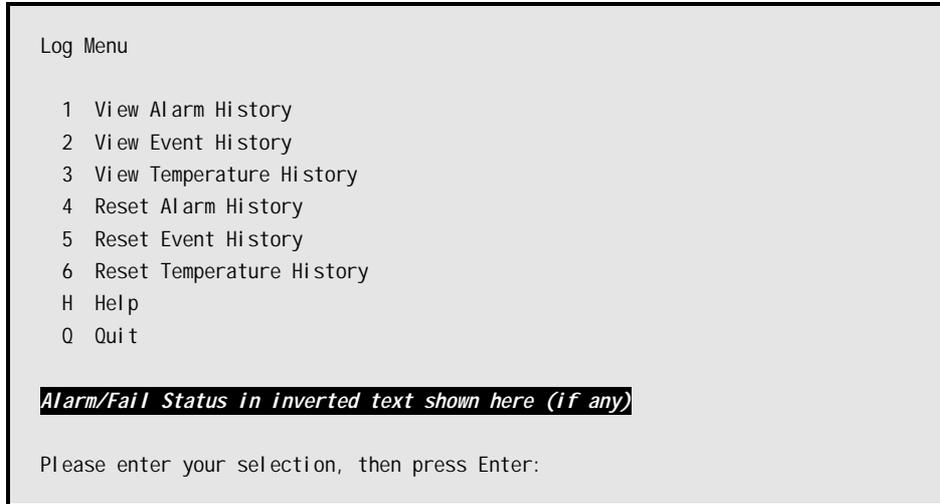
Table 3.9: System Menu Option 9: Factory Reset Menu Options

Command	Description
1 Reset System Data Only	This command sets all data to the Factory Defaults except for DPC Profiles and Networking data.
2 Reset All DPC Transponder Profiles	This sets profiles 1-25 to Null-Corr profiles.
3 Reset All Except Networking Data	This performs the same action as option 1, except all saved configurations and pre-correction curves are deleted.

3.8 Main Menu Option 5: Log Menu

3.8.1 Log Menu Overview

Type **5** at the prompt to enter the Log Menu from the Main Menu. This menu allows the various Modulator logs to be viewed and reset.

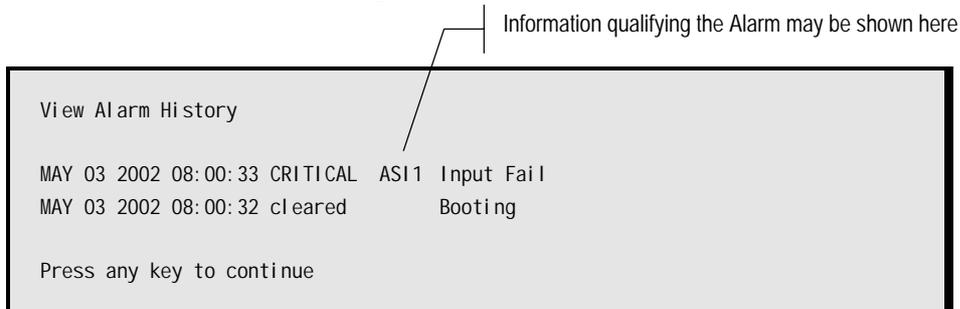


3.8.2 Log Menu Options

Log Menu Option 1: View Alarm History

The alarms log indicates irregularities in the input signals to the Modulator, or internal conditions of malfunction. It can help in fault diagnosis.

To select the View Alarm History screen from the Log Menu type **1** at the prompt. See *Chapter 8, Section 8.9, Alarm and Failure Reporting* for lists of possible Alarm Log entries.



Log Menu Option 2: View Event History

This event log shows a record of normal operating activity in the Modulator which may have a bearing on its current state.

To select the View Event History screen from the Log Menu type **2** at the prompt. See *Chapter 8, Section 8.10, Event Reporting* for a list of possible Event Log entries.

```
View Event History

MAY 03 2002 07:58:04 : Telnet user logged in
MAY 03 2002 07:58:04 : New configuration saved
MAY 03 2002 07:58:04 : New configuration saved
MAY 03 2002 07:58:04 : The Modulator restarted
MAY 03 2002 07:58:04 : Temperature log reset

Press any key to continue
```

Log Menu Option 3: View Temperature History

This log shows minimum and maximum recorded temperatures as well as the current temperature within the Modulator casing. It verifies the unit is not being subjected to undue environmental stress.

To select the View Temperature History screen from the Log Menu type **3** at the prompt. Displays the temperature log:

```
View Temperature History

Temperature max/min since 23 FEB 2001 11:54:22
Minimum temperature 25.0 deg C at 23 FEB 2001 11:54:22
Maximum temperature 29.5 deg C at 23 FEB 2001 11:54:35
Current temperature 29.5 deg C

Press Enter to continue
```

Log Menu Option 4: Reset Alarm History

Resetting historical logs removes obsolete information that might otherwise become confusing. In the absence of explicit resets, the oldest recorded data will be overwritten once the allocated recording capacity has been filled.

To select the Reset Alarm History option from the Log Menu type **4** at the prompt. This will clear the alarm log.

```
Reset Alarm History

Alarm history reset

Press Enter to continue
```

Log Menu Option 5: Reset Event History

To select the Reset Event History option from the Log Menu type **5** at the prompt. This selection clears out the event log.

```
Reset Event History

Event history reset

Press Enter to continue
```

Log Menu Option 6: Reset Temperature History

To select the `Reset Temperature History` option from the `Log Menu` type **6** at the prompt. This option sets both recorded temperature extremes to the current temperature.

```
Reset Temperature History

Temperature log reset.

Press Enter to continue
```

Log Menu Option H: Help

Type **H** at the prompt to view information about the options on the `Log Menu`.

Log Menu Option Q: Quit

Type **Q** at the prompt to return to the `Main Menu`.

3.9 Main Menu Option 6: Test Menu

3.9.1 Test Menu

Type **6** at the prompt to enter the `Test Menu` from the `Main Menu`. The `Test Menu` allows access to test functions to verify the correct operation of the Modulator. If working properly it should pass all the tests.

CAUTION...

Most of the functions in the `Test Menu` cause the Modulator to lose its configuration. In this event a warning message is displayed and confirmation must be given to continue with the test.

```
Test Menu          Test Execution Times:

 1 Quick NVRAM Test ← 1 second
 2 Full NVRAM Test  ← 15 minutes
 3 Version and Build Information
 4 Test Relays
 5 Test LCD
 6 Test Keypad
 H Help
 Q Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
```

NOTE...
If a test fails contact TANDBERG Television Customer Services for advice and assistance.

3.9.2 Test Menu Options

Option 1: Quick NVRAM Test

Subjects the various specialised Random Access Memory (NVRAM) arrays to simple data pattern retention tests.

Type **1** at the prompt to select the `Quick NVRAM Test` option from the `Test Menu`. These quickly test correct operation of the NVRAMs in the Modulator.

```
Quick NVRAM Test

Testing NVRAM : Passed

Test Passed

Press Enter to continue
```

Option 2: Full NVRAM Test

Similar to the Quick RAM test but employing more extensive test patterns to pick up more subtle address or data bus malfunctions.

Type **2** at the prompt to select the `Full NVRAM Test` option from the `Test Menu`. Each test comprises an extensive address bus test followed by a data bus test.

The address bus test performs a write-read action to all locations and cross-checks the contents of non-addressed locations. The data bus test performs a series of write-read actions to check the performance of each bit of every location. If the address bus test fails, the data bus test is not performed.

NOTE...
This test can take a long time (tens of minutes!).

```
Full NVRAM Test

Testing battery backed RAM
Blanking RAM
Performing addressing tests
```

Option 3: Version and Build Information

Type **3** at the prompt to select the `Version and Build Information` option from the `Test Menu`. This displays the current software and firmware versions as well as hardware revisions and serial numbers.

```
Identifying Name           : Merlin
Unit Inventory Serial No.  : 9234
Unit Initialisation Date   : APR 26 2002 07:46:17
Last Boot Time             : May 10 2002 15:02:29

Controller Card
  PCB Revision              : 3
  Modification Status       : 0
  Serial No.                : 00080014DDF3
  Firmware Version          : 1.1
  Boot Software Version     : 01.00
  Main Software Version     : 03.01
  Web Site Version          : 01.03

Backplane
  PCB Revision              : 2
  Modification Status       : 0
  Firmware Version          : 1.1

Modulator Baseband Card
  Card Type                 : S10309
  PCB Revision              : 5
  Modification Status       : 0
  Serial No.                : 000800116965
  CPLD Firmware Version     : 1.4
  DSP Firmware Version      : 1.1
  RNF Firmware Version      : 1.0
  Software Version          : 1.0

Modulator IF Card
  Card Type                 : S10310
  PCB Revision              : 3
  Modification Status       : 0
  Serial No.                : 000800114E24
  Firmware Version          : 1.1

DPC Card
  Card Type                 : Not fitted

Input Card
  Card Type                 : S11341
  PCB Revision              : 3
  Modification Status       : 0
  Serial No.                : 00080014D757
  Firmware Version          : 1.2

Licence Key Features
  Enabled Features          : None

Press Enter to continue
```

Option 4: Test Relays

Type **4** at the prompt to select the `Test Relays` option from the `Test Menu`. This allows the correct operation of the relay outputs to be tested. This test also lights the front panel Alarm LED and checks the operation of the alarm and fail relay switches.

```
Test Relays

Relay test mode will exit automatically after 5 minutes of inactivity.

                        [or type 0 and press ENTER]

Both relays now set to OFF

Press Enter to continue

Alarm relay SET, Fail relay CLEAR.

Press Enter to continue

Alarm relay CLEAR, Fail relay SET.

Press Enter to continue
```

Option 5: Test LCD

Type **5** at the prompt to select the `Test LCD` menu from the `Test Menu`. This option allows the front panel display operation to be verified.

```
Test LCD

LCD should now be displaying:

0123456789012345678901234567890123456789
abcdefghijklmnopqrstuvwxyz{[]-+!$%&^*(

Press Enter to continue
```

Option 6: Test Keypad

Type **6** at the prompt to select the `Test Keypad` menu from the `Test Menu`.

This option allows the front panel keypad to be verified. Once selected, the keys pressed on the front panel are displayed on the terminal and the associated key is illuminated.

```
Test Keypad

Press buttons on the keypad. The button pressed will light up.
Press any key on the keyboard to exit.
```

Option H: Help

Type **H** at the prompt to view information about the options on the `Test Menu`.

Option Q: Quit

Type **Q** at the prompt to return to the Main Menu.

3.10 Main Menu Option 7: Software Update Menu

3.10.1 Software Update Menu

Type **7** at the prompt to enter the Software Update Menu from the Main Menu. This menu provides options for the following:

```
Software Update Menu

1 Validate Newly Downloaded Code
2 Switch To Backup Code
3 Display Code Versions
4 Reboot Modulator
H Help
Q Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
```

3.10.2 Software Update Menu Options

Software Update Menu Option 1: Validate Newly Downloaded Code

Removes the start-up pause that can be used to restore previous software. This pause serves as a recovery strategy when a newly installed software version fails.

```
Validate Newly Downloaded Code

Current version built Nov 13 2002, 09:27:30

Validating code...
Code validated OK.

Press Enter to continue
```

This option marks the code as being valid. After a software download, the Modulator will pause for five seconds during boot before starting the main application code. This is done to allow the user to prevent the code from running in the situation where invalid code has been downloaded. Selecting **Validate Newly Downloaded Code** will remove this pause.

Software Update Menu Option 2: Switch To Backup Code

When software is updated, the previously installed version is retained as a backup copy. This option restarts that earlier software version.

```
Switch To Backup Code

Current Code Version.
Current Version number : V03.01.00000
                TimeStamp : Nov 13 2002 09:27:30

Current Bank is 1
Switching to Bank 2
Backup code details:
Backup Version number : V03.01.00000
                TimeStamp : Nov 13 2002 09:27:30

Are you sure you want to switch to this code?(Y/N)
```

This option allows the user to revert to the last used main application code. Selecting this option will display the details of the previous version of code loaded into the Modulator:

If **Y** is typed, the backup code and the current code are switched over. The Modulator must be rebooted to start running the backup code.

Option 3: Display Code Versions

Displays versions of the current main application code and backup code.

Option 4: Reboot Modulator

Select option **4** to reboot the Modulator. This is only needed after a code download or after switching to backup code. When selected, a confirmation prompt is displayed. If this operation is via the Telnet interface, an additional warning is displayed.

```
Reboot Modulator

Rebooting the Modulator will terminate this network connection.

Are you sure you want to reboot the modulator?(Y/N):
```

3.11 Main Menu H Option: Help

Type **H** at the prompt to select the `Help` option from the Main Menu.

3.12 Main Menu X Option: Exit Session

Type **X** at the prompt to select the `Exit Session` from the Main Menu. This option disconnects the user from the Modulator if connected via Telnet.

Chapter 4

Front Panel Control

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4.1 Front Panel Control

4.1.1 Introduction

CAUTION...

Only one logical control interface on the Modulator, i.e. Front Panel, Terminal, SNMP Remote Control, FTP, etc, should be used at any one time. Using more than one interface simultaneously may cause unexpected behaviour of the Modulator.

Partial control and monitoring of the Modulator is provided via the front panel's LCD screen and pushbuttons.

NOTE...

Certain functionality of the Modulator is dependent upon which options have been purchased by the customer. Functionality is enabled or disabled by means of licence keys installed in the Modulator. The options available in some front panel and terminal menus are dependent upon which licence keys have been installed. See Chapter 9 for further information about licence keys.

4.1.2 Booting

NOTE...

If necessary, refer to *Chapter 2, Installation* for powering up and down procedures.

At switch-on the Modulator runs through a short boot sequence. The following boot display is shown briefly on the control panel before displaying the **Main Menu** screen.

```
TANDBERG      Satellite Modulator SM5600
Television    Software V03.01 Booting...
```

4.1.3 Navigating the Menus

Pushbuttons

There are six pushbuttons on the front panel which allow menus to be selected and commands or options chosen. The pushbuttons are shown in *Figure 4.1*. The pushbutton functions are described in *Table 4.1*.

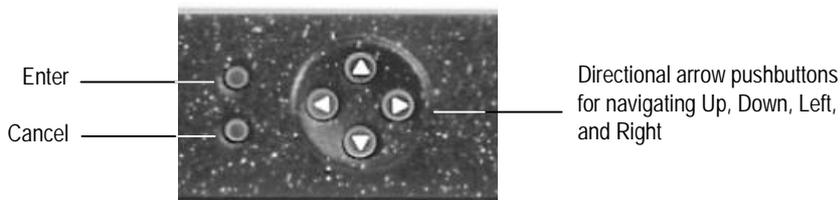


Figure 4.1: Front Panel Pushbuttons

Table 4.1: Front Panel Pushbutton Functions

Pushbutton	Description
⊙ Enter	Main pushbutton for making selections.
⊙ Cancel	Takes user back one menu; or out of Edit Mode, cancelling any changes made.
◀ ▶ ▲ ▼	Directional arrow pushbuttons for navigating Up, Down, Left, and Right.

Screen Symbols

The front panel display uses a number of symbols and conventions. *Figure 4.2* illustrates the use of arrows on the front panel display. *Table 4.2* describes the symbols and conventions used with the front panel display.

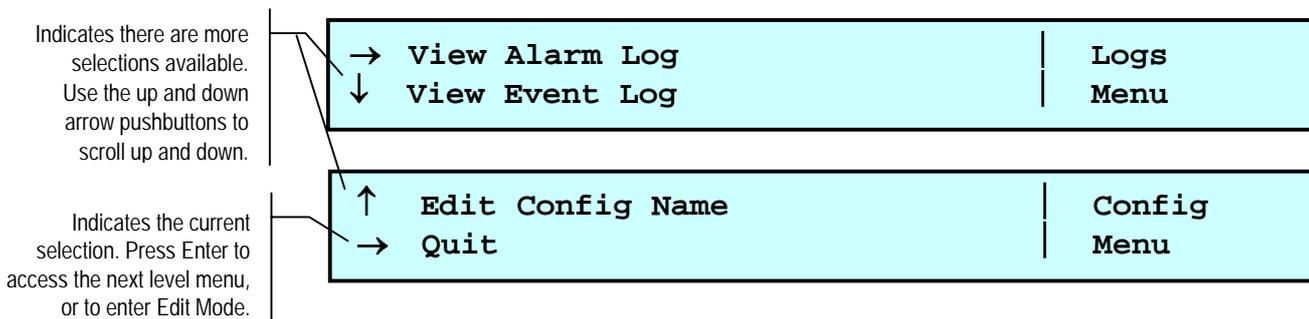


Figure 4.2: Front Panel LCD Symbols

Table 4.2: Front Panel LCD Symbols

Symbol	Description
↑	Indicates there are more menu selections above.
↓	Indicates there are more menu selections below.
→	Indicates current selection that can be edited or viewed. To change the selection use the arrow pushbuttons to scroll up and down.
—	Dash indicates current selection (viewing only).
[]	Data can be edited when enclosed in brackets. Either toggle (eg Enabled/Disabled) by pressing any arrow pushbutton; or individually make changes to a character when it is underlined.
[_]	An underlined digit can be edited. Use the up and down arrow pushbuttons to scroll through the characters; use the left and right arrow pushbuttons to move to the next digit.

4.2 User Interface Modes

4.2.1 Types of Interface Mode

There are two user interface modes as follows:

- Monitor Only mode
- Full Access mode

To change the user mode refer to the **Front Panel Setup Menu**. This is found in *Section 3.7* as option 6 of the *System Menu* in *Chapter 3, Operating the Equipment Locally*.

4.2.2 Monitor Only Mode

All configuration and log information can be viewed but the user cannot edit or clear logs, and cannot save or load configurations. In **Monitor Only** mode the **Main Menu** is as follows:



Scroll down to access the remainder of the top-level options as shown in *Table 4.3*.

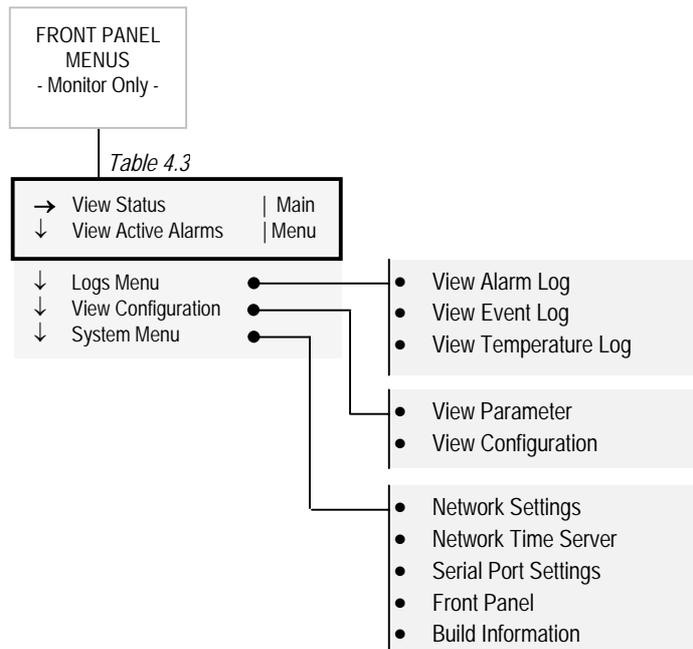


Figure 4.3: Monitor Only Menus

Table 4.3: Monitor Only Menu Options

Top Level	Sub-level	Description
View Status		Displays the current status and temperature, and current date and time.
View Active Alarms		Gives a snapshot of present alarms when Enter is pressed.
Logs Menu	View Alarm Log	History of alarms, eg: Input stream errors.
	View Event Log	History of events, eg: When Modulator was restarted, When new configuration was saved.
	View Temperature Log	History of temperatures, eg: Minimum, maximum, current
View Configuration	View Parameter	Allows viewing of the current parameters individually.
	View Configuration	Allows viewing of the configuration settings for configurations 0 - 9.

Top Level	Sub-level	Description
System Menu	Network Settings	Allows viewing of the IP address, gateway IP address, subnet mask, gateway enable state and SNMP Mode.
	Network Time Server	Allows viewing of the IP address, time protocol, and enable state of the network time server.
	Serial Port Settings	Allows viewing of the Port Mode, Interface, Flow Control and Baud Rate.
	Front Panel	Allows viewing of the Keypad Beep Setting (ON/OFF), Date Format and LCD Contrast.
	Build Information	Displays information relating to the unit. This includes card, revision and modification details. The main software version is also displayed under this option.

4.2.3 Full Access Mode

In this mode the Modulator can be fully controlled giving the user full access with editing and viewing capabilities for all accessible menus. In **Full Access** mode the **Main Menu** is as shown in *Figure 4.4*.

NOTE...
 In Full Access mode, the Change Parameter and Change Configuration options may be accessed via the front panel even if the unit is in remote control. Confirmation of the action is required before a change can be made.

Information on using the front panel to change parameters and configurations is given in *Sections 4.2.4 to 4.2.7*.

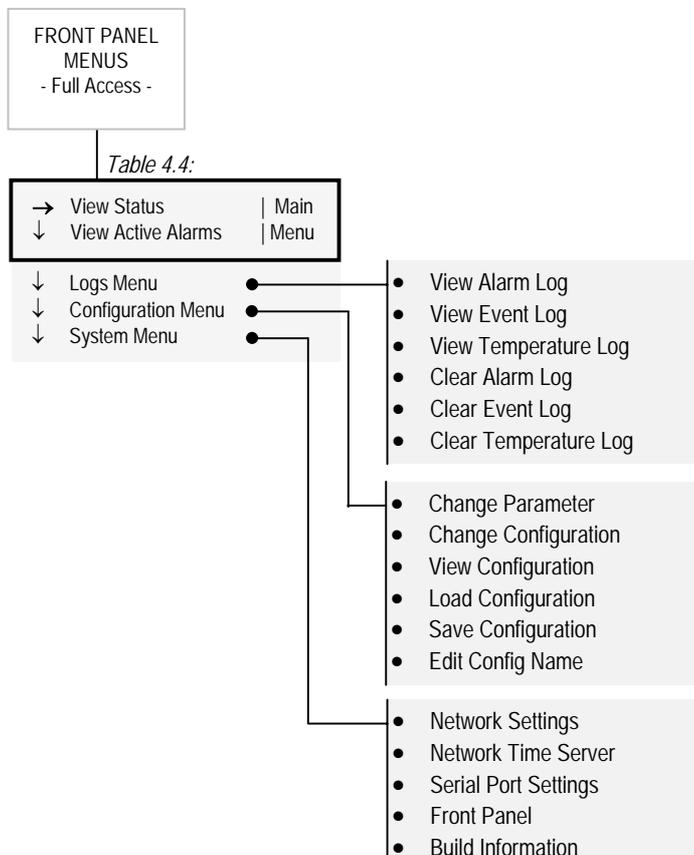


Figure 4.4: Full Access Menus

Table 4.4: Full Access Menu Options

Top Level	Sub-level	Description
View Status		Displays the current status and temperature, and current date and time.
View Active Alarms		Gives a snapshot of present alarms when Enter is pressed.
Logs Menu	View Alarm Log	History of alarms, eg: Input stream errors.
	View Event Log	History of events, eg: When Modulator was restarted, When new configuration was saved.
	View Temperature Log	History of temperatures, eg: Minimum, maximum, current
	Clear Alarm Log	} Clears respective log history.
	Clear Event Log	
	Clear Temperature Log	
Configuration Menu	Change Parameter	Allows changes to the current parameters individually: Data Select: ASI1, ASI2, SPI, Null Pkts, PRBS Packet Size: 188, 204 bytes Error Flag: OFF, ON Bit Rate: 1 – 84 Mbit/s (variable limits, dependent upon selected Packet Size, Modulation and FEC Rate) Symbol Rate: 1 – 48 Msymbol/s Coding Mode: DVB Modulation: BPSK, QPSK, 8PSK, 16QAM FEC Rate: 1/2, 2/3, 3/4, 5/6, 7/8, 8/9 (available values dependent upon selected Modulation) Roll-off: 20%, 25%, 30%, 35% IF Frequency: 50 – 180 MHz with IF Output option or 950 – 1750 MHz with L-Band Output option IF Power: –20 to 5 dBm IF Output: ON, OFF Mod. State: ON, OFF IF Spectrum: Normal, Inverted UpConv Pwr: ON, OFF (available only with L-Band Output option) UpConv Ref: ON, OFF (available only with L-Band Output option) IF Low Power: –20 to 5 dBm Carrier Act: Norm. Power, Low Power, IF Off Power Mode: Active, Standby (available only with IF Output option)
	Change Configuration	Allows changes to the current configuration settings as a block of changes: Data Select: ASI1, ASI2, SPI, Null Pkts, PRBS Packet Size: 188, 204 bytes Error Flag: OFF, ON Bit Rate: 1 – 84 Mbit/s (variable limits, dependent upon selected Packet Size, Modulation and FEC Rate) Symbol Rate: 1 – 48 Msymbol/s Coding Mode: DVB

Top Level	Sub-level	Description
		Modulation: BPSK, QPSK, 8PSK, 16QAM FEC Rate: 1/2, 2/3, 3/4, 5/6, 7/8, 8/9 (available values dependent upon selected Modulation) Roll-off: 20%, 25%, 30%, 35% IF Frequency: 50 – 180 MHz with IF Output option or 950 – 1750 MHz with L-Band Output option IF Power: –20 to 5 dBm IF Output: ON, OFF Mod State: ON, OFF IF Spectrum: Normal, Inverted UpConv Pwr: ON, OFF (available only with L-Band Output option) UpConv Ref: ON, OFF (available only with L-Band Output option) Power Mode: Active, Standby (available only with IF Output option)
	View Configuration	Allows viewing of the configuration settings for configurations 0 - 9.
	Load Configuration	Allows the loading of any previously stored configurations.
	Save Configuration	Allows current configurations to be stored in Flash memory.
	Edit Config Name	Allows the configuration names to be edited.
System Menu	Network Settings	Allows configuration of the IP address, gateway IP address, subnet mask, gateway enable state and SNMP Mode.
	Network Time Server	Allows configuration of the IP address, time protocol, and enable state of the network time server.
	Serial Port Settings	Allows setting of the Port Mode, Interface, Flow Control and Baud Rate.
	Front Panel	Allows setting of the Keypad Beep (ON/OFF), Date Format and LCD Contrast.
	Build Information	Displays information relating to the unit. This includes card, revision and modification details. The main software version is also displayed under this option.

4.2.4 Edit Mode

Press **Enter** to expand a selected submenu and to permit a value to be changed. Press **Cancel** to deselect the edited parameter or close the current submenu.

In edit mode, data can be edited when enclosed in brackets. Either toggle to make a change (eg Enabled/Disabled or On/Off) by pressing any arrow pushbutton; or individually make changes to a character when it is underlined.

Use the up and down arrow pushbuttons to scroll through the characters; use the left and right arrow pushbuttons to move to the next digit (for example: **[70.000] MHz**).

Press **Enter** to save changes.

4.2.5 Change Configuration

To change the configuration, a pending configuration is created by selectively modifying various parameters as required.

When all changes have been made, select **Quit**. The following will be displayed:

→ No	Reconfigure the	
Yes	Modulator now?	

Select **Yes** to make the pending configuration become the current configuration.

Select **No** to discard all changes.

All of the parameter changes in the configuration are executed together. A final display will show the configuration has been copied and the values have been changed.

NOTE...

Some parameters available in the **Change Parameter** menu are not available in this menu.

4.2.6 Change Parameter

The Change Parameter menu permits each parameter change to be executed independently and immediately in the current configuration.

NOTE...

Some parameters available in this menu are not available in the **Change Configuration** menu.

4.2.7 Example: Setting the IP Address from the Front Panel

To set the IP address (and other networking parameters) from the front panel, perform the following:

1. Select the **System Menu** from the **Main Menu**.
If the Main Menu is not the current display, press the **Cancel** button until **Main Menu** is displayed on the right of the screen. The system menu is the fifth item in the main menu; press the down arrow until it is selected:

↑	Configuration Menu	Main
↓ →	System Menu	Menu

2. Enter the **System Menu** by pressing **Enter**.
3. Select the **Network Settings** menu which is the first item in the system menu. Press **Enter** to enter the menu.
4. The IP address, subnet mask, gateway IP address and gateway enable state can now be edited. To change an item, select it using the up and down keys, then press **Enter** on the item you wish to change. The current digit being edited is underlined in the following IP Address:

→	IP Addr : [172.016.250.180]	Edit
↓	Mask : 255.255.000.000	Mode

5. Press the up and down arrow keys to cycle through the characters. Use the left and right keys to navigate along the address. When finished, press **Enter** to confirm the change. To cancel the change, press **Cancel**.

NOTE...
Erroneous address settings cannot be saved.

4.3 Configuration Options

Table 4.5 lists the options available.

Table 4.5: Configuration Options

Configuration Setting	Options
Data Select	ASI 1, ASI 2, SPI, Null Pkts, PRBS
Packet Size	204 bytes, 188 bytes
Error Flag	ON, OFF
Bit Rate	xxx.xxxxxx Mbit/s
Symbol Rate	xx.xxxxxx Msym/s
Coding Mode	DVB
Modulation	BPSK, QPSK, 8PSK, 16QAM
FEC Rate	1/2, 2/3, 3/4, 5/6, 7/8, 8/9
Roll-off	20%, 25%, 30%, 35%
IF Frequency	xxxx.xxx MHz
IF Power	xx.x dBm
IF Output	ON, OFF
Mod. State	ON, OFF
IF Spectrum	Normal, Inverted
UpConv Pwr	ON, OFF (available only with L-Band Output option)
UpConv Ref	ON, OFF (available only with L-Band Output option)
IF Low Power	xx.x dBm
Carrier Act	Norm Power, Low Power, IF OFF
Power Mode	Active, Standby (available only with IF Output option)

Chapter 5

RS-232 Remote Control Protocol

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5.1 Introduction

5.1.1 Read This First!

This chapter covers the RS-232 Remote Control Protocol only. For RS-485, see *Chapter 6*.

NOTE...

The rear panel RS-232/485 connector is compatible with either RS-232 or RS-485, depending upon the mode selected on the Modulator. (See *Section 3.7 System Menu, Option 4, Serial Port Configuration*.)

5.1.2 Interface Requirements

General

CAUTION...

Only one logical control interface on the Modulator, i.e. Front Panel, Terminal, SNMP Remote Control, FTP, etc, should be used at any one time. Using more than one interface simultaneously may cause unexpected behaviour of the Modulator.

NOTE...

This chapter covers Version 3 of the Remote Control Protocol.

The Modulator is able to accept the remote control messages defined in this Chapter either via RS-232 or Ethernet.

RS-232

The rear panel connector is designated **RS-232/485**. This is configured to run between 300 and 38400 baud (see *Section 3.7 System Menu, Option 4, Serial Port Configuration*).

Before the Modulator will accept commands via the RS-232/485 port using the RS-232 remote control protocol, the `Port Mode` must first be set to **Remote** and the `Interface` must be set to **RS-232**. See *Chapter 3, Section 3.7.2* for details of how to perform this.

Ethernet

The Modulator listens on port 999 for remote control messages. Only one connection of this type is allowable at any one time. The Modulator also supports SNMP remote control via the Ethernet ports. See ST.TS.SNMP.E10052 for details.

5.1.3 Communications Protocol

Type - Length - Value (TLV) system

The protocol is based on the type - length - value (TLV) system. This TLV is wrapped with a start identifier, a total length and a checksum. This system does allow for multiple TLV sections to be included within one message, but this is not supported by the Modulator, only one TLV may be present in one message.

Message Definition

The Modulator replies to every message received. In all cases except for an error, the type of the reply message is the same as the received message.

Table 5.1: Message Syntax

Start	** for messages to the Modulator, \$\$ for message from the Modulator
message length	The total length of the message starting from the type up to and including the checksum
type	The type of the message - detailed in the following sections
length	The length of the value
value	The data
checksum	The checksum. Calculated by adding the bytes from type to the end of value, ignoring carry, expressed as 8-bits.

Example Message

Table 5.2 shows an example of a Message sent to the Modulator.

Table 5.2: Example Message

Byte	Value	Description
1	0x2A	**
2	0x2A	**
3	0x05	The total length of the TLV section + checksum
4	0x01	The type of the message
5	0x02	The size of the value section
6	0xFE	First byte of value
7	0x12	Second byte of value
8	0x13	The checksum

The example shown in *Table 5.2* sends a message to the Modulator of type 1 containing two bytes 254 and 18.

Byte Ordering

Where multiple byte values are sent, they must be ordered with the most significant byte first.

Message Extensions

To allow for enhancements, the receiver of the message from the Modulator must not assume the location of the checksum, but should calculate its location from the message length field. Doing this will allow for the message to grow in size and still be received. If additional data is added to a message it will be added at the end, thus allowing software written for an earlier version of the message to still function.

Resetting the Link

Once the start sequence has been received by the Modulator it will continue to receive data until it has a complete message. To ensure that the Modulator is ready to receive a new message, sending a series of 255 space characters (0x20) will reset the internal buffers. This, however, should not be required unless there has been some previous communications problem. In doing this, the Modulator may send an error indicating that the message is too long.

5.2 Messages to the Modulator

5.2.1 Functionality Constraints Imposed by Licence Keys

Certain functionality of the Modulator is dependent upon which options have been purchased by the customer. Functionality is enabled or disabled by means of licence keys installed in the Modulator. The validity of some parameter values in configuration messages to the Modulator is dependent upon which licence keys have been installed. Parameter values are validated by the Modulator and accepted or rejected as appropriate. For example, 8PSK modulation, and its associated FEC rate 8/9, are only available if the licence key for the 8PSK option has been installed. See Chapter 9 for further information about licence keys.

5.2.2 Activate Configuration

Sending this message activates a stored configuration in the Modulator. Configurations 1-8 are user stored configurations, but Configuration 9 is the configuration of default values for Modulator parameters. These default values are built into the application code.

Table 5.3: Activate Configuration Parameters

Type	0x71	
Length	1	Size
Value	Configuration Number	1 - 9
		1

5.2.3 Upload Configuration

Sending this message retrieves the specified configuration from the Modulator. Configuration 0 is the current configuration.

Table 5.4: Upload Configuration

Type	0x73	
Length	1	Size
Value	Configuration Number	0 - 9
		1

5.2.4 Upload Current Configuration

Sending this message retrieves the current configuration from the Modulator.

Table 5.5: Upload Current Configuration

Type	0x74
Length	0

5.2.5 Download Configuration

This message downloads and activates (so becoming the current configuration) a configuration to the Modulator. The configuration structure can be upgraded by defining a new protocol version number and adding the extra fields required at the end of the message.

Table 5.6: Download Configuration

Type	0x70		Size
Length	Depends on protocol version		
Value	Protocol Version	0x00 – 0xFF (See Section 5.8 Protocol Version)	1
	Input Select	0x00 - SPI 0x01 - ASI 1 0x02 - Reserved 0x03 - ASI 2 0x10 - Test packets (NULL) 0x11 - Test packets (PRBS)	1
	Sync Mode	0x00 - Psync (default) 0x01 - Unused	1
	Packet Size	0x00 - 204 byte 0x01 - 188 byte	1
	Error flag insertion	0x00 – Off	1
	Enable MPEG-2 transport stream error flag insertion on input fail	0x01 – On	
	Bit-rate	Byte 1: Bit-rate bits (31..24) Byte 2: Bit-rate bits (23..16) Byte 3: Bit-rate bits (15..8) Byte 4: Bit-rate bits (7..0) eg 155 Mbit/s = 0x093D1CC0	4
	Set interface bit-rate, 1 bit/s increments. This value is only used if Symbol rate is set to 0xFFFFFFFF	Byte 1: Symbol rate bits (31..24) Byte 2: Symbol rate bits (23..16) Byte 3: Symbol rate bits (15..8) Byte 4: Symbol rate bits (7..0) eg 30 Msymbol/s = 0x01C9C380	4
	Symbol rate	Byte 1: Symbol rate bits (31..24) Byte 2: Symbol rate bits (23..16) Byte 3: Symbol rate bits (15..8) Byte 4: Symbol rate bits (7..0) eg 30 Msymbol/s = 0x01C9C380	4

FEC rate	0x00 - Reserved	1		
	0x01 - Reserved			
	0x02 - Reserved			
	0x03 - 1/2			
	0x04 - 2/3			
	0x05 - 3/4			
	0x06 - 5/6			
	0x07 - 7/8			
	0x08 - 8/9			
Modulation/coding mode	0x00 - Reserved	1		
	0x01 - DVB			
Modulation format	0x00 - QPSK	1		
	0x01 - BPSK			
	0x02 - 8PSK			
	0x03 - 16QAM			
Spectrum sense	0x00 - Normal	1		
	0x01 - Inverted			
Spectrum roll-off factor (Alpha)	0x00 - Reserved	1		
	0x01 - Reserved			
	0x02 - 20%			
	0x03 - 25%			
	0x04 - 30%			
	0x05 - 35%			
Modulation On/Off	0x00 - Off	1		
	0x01 - On			
IF Low Power	Format as IF Power	2		
Carrier activation mode Sets carrier activation from configure (and other) states	0x00 - Normal	1		
	0x01 - Low Power			
	0x02 - IF Off			
IF Power Set IF power in 0.1 dB steps	Byte 1: IF Power bits (15..8)	2		
	Byte 2: IF Power bits (7..0) Value as signed 16-bit integer. eg: 0x000A = 1.0 dBm, 0xFFFF = -0.1 dBm			
IF Frequency Set IF frequency in 1 kHz units	Byte 1: Frequency bits (23..16)	3		
	Byte 2: Frequency bits (15..8)			
	Byte 3: Frequency bits (7..0)			
	eg: 70 MHz = 0x11170			
General Control S/W reset initiates a Modulator reset Sets Reference Frequency Offset enabled/disabled. When enabled, the user-entered Reference Frequency Offset overrides the factory calibration value.	Bit	0	1	1
	0 - S/W reset	Normal	Enabled	
	1 - Power Saving Mode	Normal	Stand-by	
	2 - Ref Freq Offset Enable	Disabled	Enabled	
	3..7 - Reserved			

Reference Frequency Offset	Byte 1: Ref Frequency Offset bits (15..8)	2
Sets Reference Frequency Offset in approximate units of 0.0016 ppm.	Byte 2: Ref Frequency Offset bits (7..0)	
Permits fine adjustment of the reference frequency used by the IF frequency synthesisers to compensate for ageing of the reference oscillator.	Value as 16-bit unsigned integer with maximum value of 0x0FFF. Zero frequency offset = 0x09C4	
Reserved	Set 0x02	1
Reserved	Set 0x00	1
IF Carrier Control	0x01 – IF Carrier Off 0x02 – IF Carrier On	1

5.2.6 Save Configuration

This message downloads a configuration to the Modulator to one of the save locations 1 - 8. The configuration structure can be upgraded by defining a new protocol version number and adding the extra fields required at the end of the message. The format of the configuration items of this message however should match those of the Download Configuration message.

Table 5.7: Save Configuration

Type	0x81		
Length	Depends on protocol version	Size	
Value	Configuration Number	1 - 8	1
	Configuration name	Max 20 characters	20
	Protocol Version	0x00 – 0xFF (See Section 5.8 Protocol Version)	1
	Input Select	0x00 - SPI 0x01 - ASI 1 0x02 - Reserved 0x03 - ASI 2 0x10 - Test packets (NULL) 0x11 - Test packets (PRBS)	1
	Sync Mode	0x00 – Psync (default) 0x01 – Unused	1
	Packet Size	0x00 – 204 byte 0x01 – 188 byte	1
	Error flag insertion	0x00 – Off	1
	Enable MPEG-2 transport stream error flag insertion on input fail	0x01 – On	
Bit-rate		Byte 1: Bit-rate bits (31..24)	4
		Byte 2: Bit-rate bits (23..16)	
		Byte 3: Bit-rate bits (15..8)	
		Byte 4: Bit-rate bits (7..0)	
		eg 155 Mbit/s = 0x093D1CC0	

Symbol rate Set symbol rate, 1 symbol/s increments. This value is used by default unless set to 0xFFFFFFFF in which case bit-rate will be used.	Byte 1: Symbol rate bits (31..24) Byte 2: Symbol rate bits (23..16) Byte 3: Symbol rate bits (15..8) Byte 4: Symbol rate bits (7..0) eg 30 Msymbol/s = 0x01C9C380	4									
FEC rate	0x00 - Reserved 0x01 - Reserved 0x02 - Reserved 0x03 - 1/2 0x04 - 2/3 0x05 - 3/4 0x06 - 5/6 0x07 - 7/8 0x08 - 8/9	1									
Modulation/coding mode	0x00 - Reserved 0x01 - DVB	1									
Modulation format	0x00 - QPSK 0x01 - BPSK 0x02 - 8PSK 0x03 - 16QAM	1									
Spectrum sense	0x00 - Normal 0x01 - Inverted	1									
Spectrum roll-off factor (Alpha)	0x00 - Reserved 0x01 - Reserved 0x02 - 20% 0x03 - 25% 0x04 - 30% 0x05 - 35%	1									
Modulation On/Off	0x00 - Off 0x01 - On	1									
IF Low Power	Format as IF Power	2									
Carrier activation mode Sets carrier activation from configure (and other) states	0x00 - Normal 0x01 - Low Power 0x02 - IF Off	1									
IF Power Set IF power in 0.1 dB steps	Byte 1: IF Power bits (15..8) Byte 2: IF Power bits (7..0) Value as signed 16-bit integer. eg: 0x000A = 1.0 dBm, 0xFFFF = -0.1 dBm	2									
IF Frequency Set IF frequency in units of 1 kHz	Byte 1: Frequency bits (23..16) Byte 2: Frequency bits (15..8) Byte 3: Frequency bits (7..0) eg: 70 MHz = 0x11170	3									
General Control S/W reset initiates a Modulator reset	<table border="1"> <thead> <tr> <th>Bit</th> <th>0</th> <th>1</th> </tr> </thead> <tbody> <tr> <td>0 - S/W reset</td> <td>Normal</td> <td>Enabled</td> </tr> <tr> <td>1 - Power Saving Mode</td> <td>Normal</td> <td>Stand-by</td> </tr> </tbody> </table>	Bit	0	1	0 - S/W reset	Normal	Enabled	1 - Power Saving Mode	Normal	Stand-by	1
Bit	0	1									
0 - S/W reset	Normal	Enabled									
1 - Power Saving Mode	Normal	Stand-by									

Sets Reference Frequency Offset enabled/disabled. When enabled, the user-entered Reference Frequency Offset overrides the factory calibration value.	2 - Ref Freq Offset Enable	Disabled	Enabled
	3..7 – Reserved		
Reference Frequency Offset	Byte 1: Ref Frequency Offset bits (15..8)	2	
Sets Reference Frequency Offset in approximate units of 0.0016 ppm. Permits fine adjustment of the reference frequency used by the IF frequency synthesisers to compensate for ageing of the reference oscillator.	Byte 2: Ref Frequency Offset bits (7..0) Value as 16-bit unsigned integer with maximum value of 0x0FFF. Zero frequency offset = 0x09C4		
Reserved	Set to 0x02	1	
Reserved	Set to 0x00	1	
IF Carrier Control	0x01 – IF Carrier Off 0x02 – IF Carrier On	1	

5.2.7 Get Version Information

This message retrieves all the version information available from the Modulator.

Table 5.8: Get Version Information

Type	0x76
Length	0

5.2.8 Get Status

This message prompts the Modulator to return the current status.

Table 5.9: Get Status

Type	0x77
Length	0

5.2.9 Save Current Configuration

Saves the current configuration to a specified configuration slot.

Table 5.10: Save Current Configuration

Type	0x80		
Length	21		Size
Value	Configuration number to save to.	1 - 8	1
	Configuration name	Max 20 characters	20

5.2.10 Get Health

Table 5.11: Get Health

Type	0x79
Length	0

5.3 Messages from the Modulator

5.3.1 Activate Configuration

Table 5.12: Activate Configuration

Type	0x71		
Length	1		Size
Value	Operation Success	0x00 - Error	1
	Invalid Parameter returned if selected config empty or not in the range 1 - 9	0x01 - OK 0x0F - Invalid Parameter	

5.3.2 Upload Configuration

If an error occurred when the Modulator processed the outgoing message, the following response will occur:

Table 5.13: Upload Configuration (Error Condition)

Type	0x73		
Length	1		Size
Value	Operation Success	0x00 - Error	1
		0x0F - Invalid Parameter	

Otherwise, the Modulator configuration is returned:

Table 5.14: Upload Configuration (Normal Condition)

Type	0x73		
Length	Depends on protocol version		Size
Value	Protocol Version	0x00 - 0xFF (See Section 5.8 Protocol Version)	1
	Input Select	0x00 - SPI	1
	Returns current input interface or test packet source	0x01 - ASI 1 0x03 - ASI 2 0x10 - Test packets (NULL) 0x11 - Test packets (PRBS)	
	Sync Mode	0x00 - Psync (default)	1
	Packet Size	0x00 - 204 byte 0x01 - 188 byte	1

Error flag insertion	0x00 – Off 0x01 – On	1
Bit-rate	Byte 1: Bit-rate bits (31..24)	4
Bit-rate converted from the current symbol rate in bit/s	Byte 2: Bit-rate bits (23..16) Byte 3: Bit-rate bits (15..8) Byte 4: Bit-rate bits (7..0) eg 0x093D1CC0 = 155 Mbit/s	
Symbol rate	Byte 1: Symbol rate bits (31..24)	4
Returns current symbol rate in units of 1 symbol/s	Byte 2: Symbol rate bits (23..16) Byte 3: Symbol rate bits (15..8) Byte 4: Symbol rate bits (7..0) eg 0x01C9C380 = 30 Msymbol/s	
FEC rate	0x03 - 1/2 0x04 - 2/3 0x05 - 3/4 0x06 - 5/6 0x07 - 7/8 0x08 - 8/9	1
Modulation/coding mode	0x01 – DVB	1
Modulation format	0x00 - QPSK 0x01 - BPSK 0x02 - 8PSK 0x03 - 16QAM	1
Spectrum sense	0x00 - Normal 0x01 - Inverted	1
Spectrum roll-off factor (Alpha)	0x02 - 20% 0x03 - 25% 0x04 - 30% 0x05 - 35%	1
Modulation On/Off	0x00 – Off 0x01 – On	1
IF Low Power	Format as IF Power	2
Carrier activation mode	0x00 - Normal 0x01 - Low Power 0x02 - IF Off	1
IF Power	Byte 1: IF Power bits (15..8)	2
Set IF power in 0.1 dB steps	Byte 2: IF Power bits (7..0) Value as signed 16-bit integer. eg: 0x000A = 1.0 dBm, 0xFFFF = -0.1 dBm	
IF Frequency	Byte 1: Frequency bits (23..16) Byte 2: Frequency bits (15..8) Byte 3: Frequency bits (7..0) eg: 0x11170 = 70 MHz	3

General Control	Bit	0	1	1
	0 – SW reset	Normal	Enabled	
	1 – Power Saving Mode	Normal	Stand-by	
When enabled, the user-entered Reference Frequency Offset overrides the factory calibration value.	2 – Ref Freq Offset Enable	Disabled	Enabled	
Reference Frequency Offset	Byte 1: Ref Frequency Offset bits (15..8)			2
Sets Reference Frequency Offset in approximate units of 0.0016 ppm.	Byte 2: Ref Frequency Offset bits (7..0)			
Permits fine adjustment of the reference frequency used by the IF frequency synthesisers to compensate for ageing of the reference oscillator.	Value as 16-bit unsigned integer with maximum value of 0x0FFF. Zero frequency offset = 0x09C4			
Reserved				1
Reserved				1
IF Carrier Control	0x01 – IF Carrier Off 0x02 – IF Carrier On			1

5.3.3 Upload Current Configuration

If an error occurred when the Modulator processed the outgoing message, the following response will occur, otherwise the current configuration is returned as with Upload Configuration.

Table 5.15: Upload Current Configuration

Type	0x74	Length	1	Size	
Value	Operation Success	0x00 - Error		1	
		0x0F - Invalid Parameter			

5.3.4 Download Configuration

Table 5.16: Download Configuration

Type	0x70	Length	1	Size	
Value	Operation Success	0x00 - Error		1	
		0x01 - OK			
		0x0F - Invalid Parameter			

5.3.5 Save Configuration

Table 5.17: Save Configuration

Type	0x81	Length	1	Size	
Value	Operation Success	0x00 - Error		1	
		0x01 - OK			
		0x0F - Invalid Parameter			

5.3.6 Get Version Information

General

This message returns all the hardware, software, and firmware version information for all fitted cards in the Modulator. This message encapsulates individual TLVs for each card found in the Modulator. The TLVs and types are defined below. TLVs can be sent in any order.

Table 5.18: Get Version Information

Type	0x76		
Length	Dependent on cards fitted	Size	
Value	Protocol Version	0x00 - 0xFF (See Section 5.8 Protocol Version)	1
	Card Type		1
	Length of card version information		1
	Value - version information		var.
TLVs are inserted for all fitted cards			

Host Controller Card (S11340)

Table 5.19: Host Controller Card (S11340)

Type	0x01		
Length	36	Size	
Value	App. Major Version Number	Text string, e.g. ASCII "01"	2
	App. Minor Version Number	Text string, e.g. ASCII "01"	2
	Reserved	Text string, e.g. ASCII "01"	2
	Reserved	Text string, e.g. ASCII "01"	2
	Reserved	Text string, e.g. ASCII "01"	2
	Reserved	Text string, e.g. ASCII "01"	2
	Monitor Major Version Number	Text string, e.g. ASCII "01"	2
	Monitor Minor Version Number	Text string, e.g. ASCII "01"	2
	Web Site Version Number	Text string with zero terminator, e.g. ASCII "01.01", "01.02" etc	6
	Host Controller Card CPLD Firmware Version	Upper nibble – major version number Lower nibble – minor version number	1
	Host Controller Card PCB Revision And Modification Status	Upper nibble – PCB revision Lower nibble – Mod status	1
	Backplane CPLD Firmware Version	Upper nibble – major version number Lower nibble – minor version number	1
	Backplane PCB Revision And Modification Status	Upper nibble – PCB revision Lower nibble – Mod status	1
	Unit Inventory Serial Number	32-bit binary, MSB first	4
	Host Controller Card Serial Number	48-bit number, MSB first	6

Modulator Baseband Card (S10309)

Table 5.20: Modulator Baseband Card (S10309)

Type	0x02		
Length	43		Size
Value	Baseband Card Type	Text string, e.g. ASCII "10309"	5
	Baseband Card PCB Revision and Modification Status	Upper nibble – PCB revision Lower nibble – Mod status	1
Value	Baseband Card Serial Number	48-bit number, MSB first	6
	Baseband Card CPLD Firmware Version	Upper nibble – major version number Lower nibble – minor version number	1
Value	Baseband Card DSP Xilinx Firmware Version	Upper nibble – major version number Lower nibble – minor version number	1
	Baseband Card RNF Xilinx Firmware Version	Upper nibble – major version number Lower nibble – minor version number	1
Value	Baseband Card Control Software Version	Upper nibble – major version number Lower nibble – minor version number	1
	IF Card Type	Text string, e.g. ASCII 10310, 11291 etc.	5
Value	IF Card PCB Revision and Modification Status	Upper nibble – PCB revision Lower nibble – Mod status	1
	IF Card Serial Number	48-bit number, MSB first	6
Value	IF Card CPLD Firmware Version	Upper nibble – major version number Lower nibble – minor version number	1
	DPC Card Type	Text string, e.g. ASCII 08238	5
Value	DPC Card PCB Revision and Modification Status	Upper nibble – PCB revision Lower nibble – Mod status	1
	DPC Card Serial Number	48-bit number, MSB first	6
Value	DPC Card DPCA Xilinx Firmware Version	Upper nibble – major version number Lower nibble – minor version number	1
	DPC Card DPCB Xilinx Firmware Version	Upper nibble – major version number Lower nibble – minor version number	1

DVB Transport Stream Input Interface Card (S11341)

Table 5.21: DVB Transport Stream Input Interface Card (S11341)

Type	0x03		
Length	8		Size
Value	DVB TSI Card Firmware Version	Upper nibble – major version number Lower nibble – minor version number	1
	DVB TSI Card PCB Revision and Modification Status	Upper nibble – PCB revision Lower nibble – Mod status	1
Value	DVB TSI Card Serial Number	48-bit number, MSB first	6

5.4 Get Status

The return below is for protocol version 4. Future expansion or changes can be made by incrementing the protocol version number.

Table 5.22: Get Status

Type	0x77				
Length	7				
Value	Protocol Version	0 – 0xFF (See Section 5.8 Protocol Version)		1	
	Modulator Status	Bit	0	1	1
		0..5 – Reserved	Default 0		
		6 – Modulation	off	on	
		7 - Carrier on/off	off	on	
	Symbol clock offset (ppm)	Signed integer value, MSB first		2	
	Temperature (°C)	Signed byte		1	
	Alarm Status	Bit	0	1	1
		0 - Reserved	Default 0		
		1 - Alarm 1	OK	set	
		2 - Alarm 2	OK	set	
		3 - Alarm 3	OK	set	
		4 - Alarm 4	OK	set	
		5 - Fail	OK	set	
		6..7 Reserved	Default 0		
	Operation Status	0x00 - Configuring		1	
		0x01 - Stand-by			
		0x02 - Active, Carrier On			

5.5 Save Current Configuration

Table 5.23: Save Current Configuration

Type	0x80			
Length	1			
Value	Operation Success	0x00 - Error		1
		0x01 - OK		
		0x0F - Invalid Parameter		

5.6 Get Health

Table 5.24: Get Health

Type	0x79			
Length	1			Size
Value	Health word MEM should assume 0x00 for normal operation	Bit	0	1
		0..5 - Reserved	Default 0	
		6 - Critical Fail	OK	FAIL
		7 - Reserved	Default 0	

5.7 Bad Message

This message is sent in reply to a message that could not be processed.

Table 5.25: Bad Message

Type	0x75		
Length	1		Size
Value	Error Code	0x00 - Bad checksum	1
		0x01 - Message too long	
		0x02 - Unknown message	

5.8 Protocol Version

The Protocol Version field should be set to 0x04.

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Chapter 6

RS-485 Remote Control Protocol

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6.1 Introduction

6.1.1 Read This First!

This chapter covers the RS-485 Remote Control Protocol only. For RS-232, see *Chapter 5*.

NOTE...

The rear panel RS-232/485 connector is compatible with either RS-232 or RS-485, depending upon the mode selected on the Modulator. (See *Section 3.7 System Menu, Option 4, Serial Port Configuration*.)

6.1.2 Interface Requirements

General

CAUTION...

Only one logical control interface on the Modulator, i.e. Front Panel, Terminal, SNMP Remote Control, FTP, etc, should be used at any one time. Using more than one interface simultaneously may cause unexpected behaviour of the Modulator.

NOTE...

This chapter covers Version 4 of the Remote Control Protocol.

The rear panel connector is compatible with either RS-232 or RS-485, depending upon the mode selected on the Modulator. The RS-485 mode can be configured to use one of several baud rates. Other settings are 8 data bits, no parity and no flow control.

RS-485

The rear panel connector is designated **RS-232/485**. This is configured to run between 300 and 38400 baud (see *Section 3.7 System Menu, Option 4, Serial Port Configuration*).

Before the Modulator will accept commands via the RS-232/485 port using the RS-485 remote control protocol, the `Port Mode` must first be set to **Remote** and the `Interface` must be set to **RS-485**. See *Chapter 3, Section 3.7.2* for details of how to perform this.

6.1.3 Communications Protocol

Type - Length - Value (TLV) system

The protocol is based on the type - length - value (TLV) system. This TLV is wrapped with a start identifier, a total length and a checksum. This system does allow for multiple TLV sections to be included within one message, but this is not supported by the Modulator, only one TLV may be present in one message.

Message Format

The protocol is based on a stream of data bytes that represent a number of fields to form a message. All the bytes are ASCII encoded except for the address field and checksum field. The subscripts of number indicate their numeric base. The fields <> in a complete message are as follows:

<start> <address> <type><value><end><checksum>

Table 6.1: Message Syntax

Start	Indicates the start of a message. For messages to the Modulator this field is the 'STX' (ASCII 2 ₁₀) character. For messages from the Modulator that indicate a message error this field is the 'NAK' (ASCII 21 ₁₀) character. For other messages from the Modulator this field is the 'ACK' (ASCII 6 ₁₀) character.
address	Indicates the identifying address of the destination or source device of the message. Device address value can be from 1 ₁₀ to 127 ₁₀ inclusive. This field is 1 byte in length.
type	Specifies the type of command/response message. This field is numeric and 2 bytes in length, with valid values.
value	Is the command/response message data. It comprises a number of sub fields. The sub fields can be numeric or TEXT values.
End	Indicates the end of a message. This field is the 'ETX' (ASCII 3 ₁₀) character.
checksum	Calculated by XOR-ing all bytes from the start field to the end field, inclusive. This field is 1 byte in length.

Example Message

Table 6.2 shows an example of a Message sent to the Modulator.

Table 6.2: Example Message

Byte	Type	ASCII Char	Value		Description
			Hex (0x)	Dec	
1	Start	STX	2	2	Start character
2	Address	A	41	65	The device address is 65
3	Type	2	24	36	The type of message
4	Type	4			
5	Value	F	FE	254	Numeric value
6	Value	E			
7	Value	6	6B7	1719	Numeric value
8	Value	B			
9	Value	7			
10	Value	N		Name 4	TEXT value
11	Value	a			
12	Value	m			
13	Value	e			
14	Value	space			
15	Value	4			
16	End	ETX	3	3	End character
17	Checksum		35	53	Checksum

The example shown in Table 6.2 sends a message to the Modulator of type 0x24.

Byte Ordering

Where a field consists of more than one byte, it must be ordered with the most significant byte first.

Message Extensions

To allow for future enhancements, the receiver of messages from the Modulator must not assume the location of the checksum based on the message type. Doing this will allow for the message to grow in size and still be received. If additional data is added to a message it will be added at the end of the value field, thus allowing software written for an earlier version of the message to still function.

Numeric Fields

A numeric field consists of 1 or more bytes. The bytes represent an ASCII encoded hexadecimal value. The following ASCII characters are allowed in a numeric field:

- Numeric characters '0' – '9'
- Upper case letters 'A' – 'F'

TEXT Fields

TEXT fields consist of 1 or more contiguous bytes. The field will normally be a fixed number of bytes. Unused bytes should be set to 'NUL' (ASCII 0). The following ASCII characters are allowed in a TEXT field:

- Numeric characters '0' – '9'
- Upper case letters 'A' – 'Z'
- Lower case letters 'a' – 'z'
- Space character (ASCII 32₁₀)

6.2 SM5600 Remote Control

6.2.1 Outline

The SM5600 message protocol works on a configuration concept. This is outlined in the diagram below. Instead of downloading individual parameter values an entire configuration is handled.

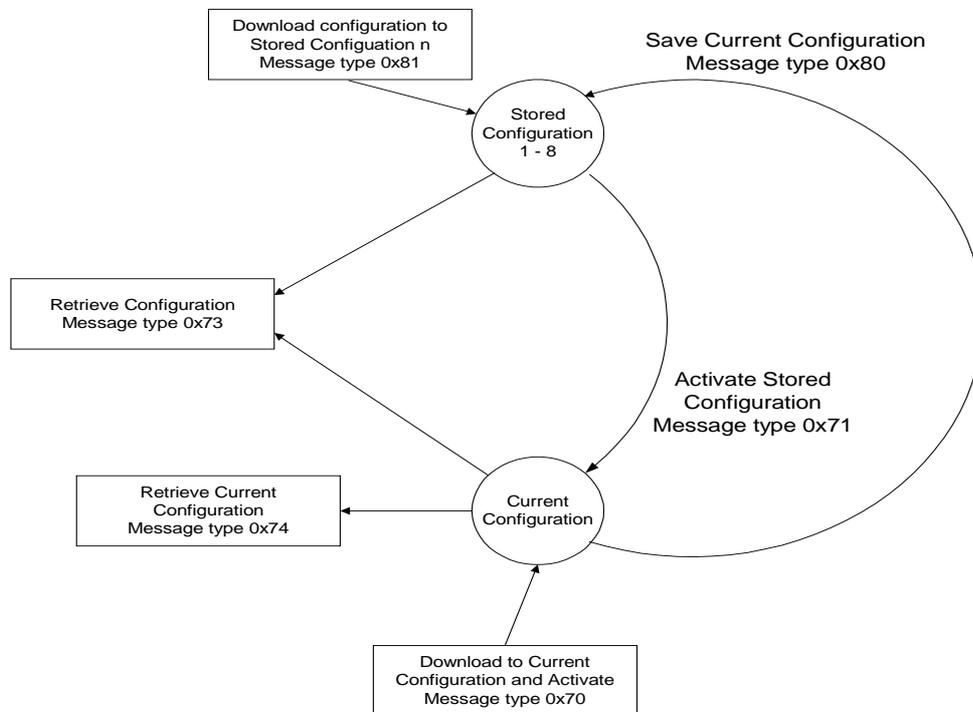


Figure 6.1: SM5600 Remote Control

Configurations can be stored in any of the 8 slots provided or activated immediately by downloading to the current configuration.

6.2.2 Functionality Constraints Imposed by Licence Keys

Certain functionality of the Modulator is dependent upon which options have been purchased by the customer. Functionality is enabled or disabled by means of licence keys installed in the Modulator. The validity of some parameter values in configuration messages to the Modulator is dependent upon which licence keys have been installed. Parameter values are validated by the Modulator and accepted or rejected as appropriate. For example, 8PSK modulation, and its associated FEC rate 8/9, are only available if the licence key for the 8PSK option has been installed. See Chapter 9 for further information about licence keys.

6.3 Messages to the Modulator

6.3.1 Activate Configuration

Sending this message activates a stored configuration in the Modulator. Configurations 1-8 are user stored configurations, but Configuration 9 is the Modulator's built-in default configuration.

Table 6.3: Activate Configuration Parameters

		Size
Type	0x71	2
Value	Configuration Number	0x01 – 0x09

6.3.2 Upload Configuration

Sending this message retrieves the specified configuration from the Modulator. Configuration 0 is the current configuration.

Table 6.4: Upload Configuration

		Size
Type	0x73	2
Value	Configuration Number	0x00 – 0x09

6.3.3 Upload Current Configuration

Sending this message retrieves the current configuration from the Modulator.

Table 6.5: Upload Current Configuration

		Size
Type	0x74	2

6.3.4 Download Configuration

This message downloads and activates (so becoming the current configuration) a configuration to the Modulator.

Table 6.6: Download Configuration

Type	0x70	Size	
Value	Protocol Version	0x00 – 0xFF (See Section 6.8 Protocol Version)	2
	Input Select	0x00 – SPI 0x01 – ASI 1 0x02 – Reserved 0x03 – ASI 2 0x10 – Test packets (Null) 0x11 – Test packets (PRBS)	2
	Reserved	Set to 0x00	2
	Packet Size	0x00 – 204 byte 0x01 – 188 byte	2
	Error flag insertion	0x00 – Off	2
	Enable MPEG-2 transport stream error flag insertion on input fail	0x01 – On	
	Bit-rate	e.g. 155 Mbit/s = 0x093D1CC0	8
	Set interface bit-rate in 1 bit/s increments. This value is only used if Symbol rate is set to 0xFFFFFFFF.		
	Symbol rate	e.g. 30 Msymbol/s = 0x01C9C380	8
	Set symbol rate in 1 symbol/s increments. This value is used by default unless set to 0xFFFFFFFF in which case bit-rate will be used.		
	FEC rate	0x00 – Reserved 0x01 – Reserved 0x02 – Reserved 0x03 – 1/2 0x04 – 2/3 0x05 – 3/4 0x06 – 5/6 0x07 – 7/8 0x08 – 8/9	2
	Modulation/coding mode	0x00 – Reserved 0x01 – DVB	2
	Modulation format	0x00 – QPSK 0x01 – BPSK 0x02 – 8PSK 0x03 – 16QAM	2
	Spectrum sense	0x00 – Normal 0x01 – Inverted	2

Spectrum roll-off factor (Alpha)	0x00 – Reserved	2		
	0x01 – Reserved			
	0x02 – 20%			
	0x03 – 25%			
	0x04 – 30%			
	0x05 – 35%			
Modulation On/Off	0x00 – Off	2		
	0x01 – On			
IF Low Power	Format as IF Power	4		
Carrier activation mode Set carrier activation from configure (and other) states	0x00 – Normal	2		
	0x01 – Low power			
	0x02 – IF Off			
IF Power Set IF power in 0.1 dB steps	Value as 16-bit signed integer e.g. 0x000A = 1.0 dBm, 0xFFFF = -0.1 dBm	4		
IF Frequency Set IF frequency in units of 1 kHz	e.g. 70 MHz = 0x011170	6		
General Control S/W reset initiates a Modulator reset	Bit	0	1	2
	0 – S/W reset	Normal	Enabled	
	1 – Power Saving Mode	Normal	Standby	
	2 – Reserved	Set to 0		
	3..7 – Reserved	Set to 0		
Reserved	Set to 0x0000			4
Reserved	Set 0x02			2
Reserved	Set 0x00			2
IF Carrier Control	0x01 – IF Carrier Off			2
	0x02 – IF Carrier On			

6.3.5 Save Configuration

This message downloads a configuration to the Modulator to one of the save locations 1 - 8.

Table 6.7: Save Configuration

Type	Value	Size
	0x81	2
Value	Configuration Number	0x01 – 0x08
	Configuration Name (TEXT)	Unused bytes set to NUL (ASCII 0)
	Protocol Version	0x00 – 0xFF (See Section 6.8 Protocol Version)
	Input Select	0x00 – SPI 0x01 – ASI 1 0x02 – Reserved 0x03 – ASI 2 0x10 – Test packets (Null) 0x11 – Test packets (PRBS)
	Reserved	Set to 0x00
	Packet Size	0x00 – 204 byte 0x01 – 188 byte
	Error flag insertion	0x00 – Off
	Enable MPEG-2 transport stream error flag insertion on input fail	0x01 – On
	Bit-rate	e.g. 155 Mbit/s = 0x093D1CC0
	Set interface bit-rate in 1 bit/s increments. This value is only used if Symbol rate is set to 0xFFFFFFFF.	8
	Symbol rate	e.g. 30 Msymbol/s = 0x01C9C380
	Set symbol rate in 1 symbol/s increments. This value is used by default unless set to 0xFFFFFFFF in which case bit-rate will be used.	8
	FEC rate	0x00 – Reserved 0x01 – Reserved 0x02 – Reserved 0x03 – 1/2 0x04 – 2/3 0x05 – 3/4 0x06 – 5/6 0x07 – 7/8 0x08 – 8/9
	Modulation/coding mode	0x00 – Reserved 0x01 – DVB
	Modulation format	0x00 – QPSK 0x01 – BPSK 0x02 – 8PSK 0x03 – 16QAM

Spectrum sense	0x00 – Normal 0x01 – Inverted	2
Spectrum roll-off factor (Alpha)	0x00 – Reserved 0x01 – Reserved 0x02 – 20% 0x03 – 25% 0x04 – 30% 0x05 – 35%	2
Modulation On/Off	0x00 – Off 0x01 – On	2
IF Low Power	Format as IF Power	4
Carrier activation mode	0x00 – Normal	2
Set carrier activation from configure (and other) states	0x01 – Low power 0x02 – IF Off	
IF Power	Value as 16-bit signed integer	4
Set IF power in 0.1 dB steps	e.g. 0x000A = 1.0 dBm, 0xFFFF = –0.1 dBm	
IF Frequency	e.g. 70 MHz = 0x011170	6
Set IF frequency in units of 1 kHz		
General Control	Bit 0 1	2
S/W reset initiates a Modulator reset	0 – S/W reset Normal Enabled 1 – Power Saving Mode Normal Standby 2 - Reserved Set to 0 3..7 – Reserved Set to 0	
Reserved	Set to 0x0000	4
Reserved	Set to 0x02	2
Reserved	Set to 0x00	2
IF Carrier Control	0x01 – IF Carrier Off 0x02 – IF Carrier On	2

6.3.6 Get Status

This message prompts the Modulator to return the current status.

Table 6.8: Get Status

		Size
Type	0x77	2

6.3.7 Save Current Configuration

Saves the current configuration to a specified configuration slot.

Table 6.9: Save Current Configuration

		Size
Type	0x80	2
Value	Configuration Number	0x01 – 0x08
	Configuration Name (TEXT)	Unused bytes set to NUL (ASCII 0)
		20

6.3.8 Get Health

Table 6.10: Get Health

		Size
Type	0x79	2

6.4 Messages from the Modulator

6.4.1 Activate Configuration

The start field for this message is ACK if OK is indicated, otherwise the start field is NAK.

Table 6.11: Activate Configuration

			Size
Type	0x71		2
Value	Operation Success	0x00 – Error	2
	Invalid Parameter returned if selected config empty or not in the range 1 - 9	0x01 – OK	
		0x0F – Invalid Parameter	

6.4.2 Upload Configuration

If an error occurred when the Modulator processed the outgoing message, the following response will occur. The start field for this message is NAK.

Table 6.12: Upload Configuration (Error Condition)

			Size
Type	0x73		2
Value	Operation Success	0x00 – Error	2
		0x0F – Invalid Parameter	

Otherwise the Modulator configuration is returned. The start field for this message is ACK.

Table 6.13: Upload Configuration (Normal Condition)

			Size
Type	0x73		2
Value	Protocol Version	0x00 – 0xFF (See <i>Section 6.8 Protocol Version</i>)	2
	Input Select	0x00 – SPI	2
	Returns current input interface or test packet source	0x01 – ASI 1 0x03 – ASI 2 0x10 – Test packets (Null) 0x11 – Test packets (PRBS)	
	Reserved	Ignore Value	2
	Packet Size	0x00 – 204 byte 0x01 – 188 byte	2
	Error flag insertion	0x00 – Off 0x01 – On	2
	Bit-rate	e.g. 0x093D1CC0 = 155 Mbit/s	8
	Returns the bit-rate in units of 1 bit/s calculated from the current symbol rate		

Symbol rate	e.g. 0x01C9C380 = 30 Msymbol/s	8												
Returns the current symbol rate in units of 1 symbol/s														
FEC rate	0x03 – 1/2 0x04 – 2/3 0x05 – 3/4 0x06 – 5/6 0x07 – 7/8 0x08 – 8/9	2												
Modulation/coding mode	0x01 – DVB	2												
Modulation format	0x00 – QPSK 0x01 – BPSK 0x02 – 8PSK 0x03 – 16QAM	2												
Spectrum sense	0x00 – Normal 0x01 – Inverted	2												
Spectrum roll-off factor (Alpha)	0x02 – 20% 0x03 – 25% 0x04 – 30% 0x05 – 35%	2												
Modulation On/Off	0x00 – Off 0x01 – On	2												
IF Low Power	Format as IF Power	4												
Carrier activation mode	0x00 – Normal 0x01 – Low power 0x02 – IF Off	2												
IF Power	Value as 16-bit signed integer	4												
IF power in 0.1 dB steps	e.g. 0x000A = 1.0 dBm, 0xFFFF = -0.1 dBm													
IF Frequency	e.g. 0x011170 = 70 MHz	6												
General Control	<table border="1"> <thead> <tr> <th>Bit</th> <th>0</th> <th>1</th> </tr> </thead> <tbody> <tr> <td>0 – S/W reset</td> <td>Normal</td> <td>Enabled</td> </tr> <tr> <td>1 – Power Saving Mode</td> <td>Normal</td> <td>Standby</td> </tr> <tr> <td>2..7 - Reserved</td> <td colspan="2">Set to 0</td> </tr> </tbody> </table>	Bit	0	1	0 – S/W reset	Normal	Enabled	1 – Power Saving Mode	Normal	Standby	2..7 - Reserved	Set to 0		2
Bit	0	1												
0 – S/W reset	Normal	Enabled												
1 – Power Saving Mode	Normal	Standby												
2..7 - Reserved	Set to 0													
Reserved	Ignore Value	4												
Reserved	Set to 0x02	2												
Reserved	Set to 0x00	2												
IF Carrier Control	0x01 – IF Carrier Off 0x02 – IF Carrier On	2												

6.4.3 Upload Current Configuration

If an error occurred when the Modulator processed the outgoing message, the following response will occur, otherwise the current configuration is returned as with Upload Configuration. The start field for this message is NAK.

Table 6.14: Upload Current Configuration

			Size
Type	0x74		2
Value	Operation Success	0x00 – Error 0x0F – Invalid Parameter	2

6.4.4 Download Configuration

The start field for this message is ACK if OK is indicated, otherwise the start field is NAK.

Table 6.15: Download Configuration

			Size
Type	0x70		2
Value	Operation Success	0x00 – Error 0x01 – OK 0x0F – Invalid Parameter	2

6.4.5 Save Configuration

The start field for this message is ACK if OK is indicated, otherwise the start field is NAK.

Table 6.16: Save Configuration

			Size
Type	0x81		2
Value	Operation Success	0x00 – Error 0x01 – OK 0x0F – Invalid Parameter	2

6.5 Get Status

The start field for this message is ACK.

Table 6.17: Get Status

				Size
Type	0x77			2
Value	Protocol Version	0x00 – 0xFF (See Section 6.8 Protocol Version)		2
	Modulator Status	Bit	0 1	2
		0..5 – Reserved	Ignore Value	
		6 – Modulation	Off On	
		7 – Carrier On/Off	Off On	
	Symbol clock offset (ppm)	Signed integer value, MSB first		4
	Temperature (°C)	Signed byte		2
Alarm Status		Bit	0 1	2
		0 – Reserved	Ignore Value	
		1 – Alarm 1	OK Set	
		2 – Alarm 2	OK Set	
		3 – Alarm 3	OK Set	
		4 – Alarm 4	OK Set	
		5 – Fail	OK Set	
	6..7 – Reserved	Ignore Value		
	Operation Status	0x00 – Configuring		2
		0x01 – Standby		
		0x02 – Active, carrier On		

6.6 Save Current Configuration

The start field for this message is ACK if OK is indicated, otherwise the start field is NAK.

Table 6.18: Save Current Configuration

				Size
Type	0x80			2
Value	Operation Success	0x00 – Error		2
		0x01 – OK		
		0x0F – Invalid Parameter		

6.7 Get Health

The start field for this message is ACK.

Table 6.19: Get Health

				Size	
Type	0x79			2	
Value	Health word	Bit	0	1	2
	Assume 0x00 for normal operation	0..5 – Reserved	Ignore Value		
		6 – Critical Fail	OK	FAIL	
		7 – Reserved	Ignore Value		

6.8 Protocol Version

The protocol version field should be set to 0x04.

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Chapter 7

Equipment Description

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7.1 Scope of this Chapter

This chapter provides a simplified overview of the evolution 5000 SM5600 Satellite Modulator.

7.2 Basic DVB-S and DVB-DSNG Principles and Techniques

7.2.1 DVB-S Modulation

The Modulator supports QPSK modulation in accordance with ETSI standard EN 300 421 (DVB-S). Additionally, it supports BPSK modulation in accordance with ETSI Technical Report TR 101 198. In the BPSK and QPSK modulation schemes, each symbol represents 1 and 2 bits of data, respectively. BPSK gives the lower bit-rate but is the most rugged with respect to noise and interference.

Five convolutional code rates are available with BPSK and QPSK modulations as follows: $1/2$, $2/3$, $3/4$, $5/6$, and $7/8$. These provide different compromises between bit-rate and ruggedness.

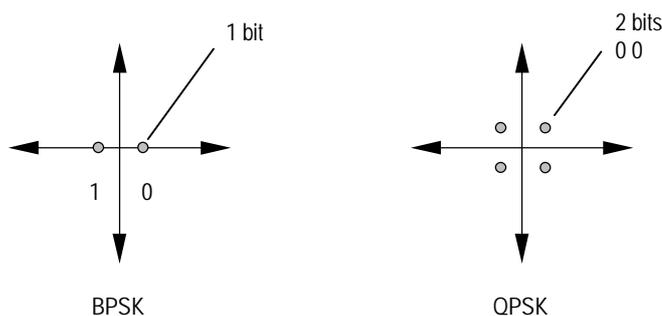


Figure 7.1: BPSK and QPSK Constellations

7.2.2 DVB-DSNG Modulation

The Modulator optionally supports 8PSK and 16QAM modulations in accordance with ETSI standard EN 301 210 (DVB-DSNG). In the 8PSK and 16QAM modulation schemes, each symbol represents 3 and 4 bits of data, respectively. 16QAM gives twice the bit-rate of QPSK, but is less rugged with respect to noise and interference.

For these modulations, pragmatic trellis coded modulation (PTCM) is used. PTCM code rates of $2/3$, $5/6$ and $8/9$ are available with 8PSK modulation. PTCM code rates of $3/4$ and $7/8$ are available with 16QAM modulation.

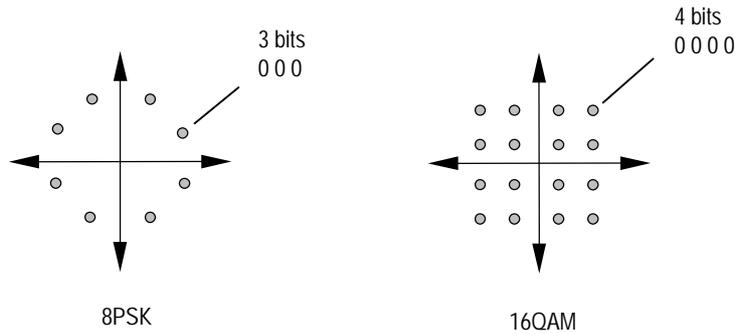


Figure 7.2: 8PSK and 16QAM Constellations

7.2.3 Forward Error Correction and Interleaving

Noise and interference can cause some bits to be received in error. To counter such errors, a concatenated forward error correction (FEC) coding scheme is used, comprising an outer Reed-Solomon (204, 188) code, convolutional interleaving and an inner convolutional code. In this scheme, firstly 16 parity check bytes are added to the data in each packet by the RS Encoder. The data are then passed through a convolutional interleaver which shuffles the order of transmission of the data bytes. Finally, the data are passed through a convolutional Encoder which adds additional redundant data bits. Different convolutional code rates can be used to provide different levels of ruggedness: $1/2$, $2/3$, $3/4$, $5/6$, $7/8$ and $8/9$, the values available being dependent upon the modulation selected.

At the Receiver the data are Viterbi decoded, de-interleaved and then RS decoded. The inner convolutional coding together with Viterbi decoding provides powerful error correction capability against errors induced by additive white Gaussian noise (AWGN) in the channel, but any residual errors at the output of the Viterbi Decoder tend to occur predominantly in blocks. The de-interleaving process redistributes the errors so that they occur more randomly as well as restoring the original order of the data bytes, allowing the following RS Decoder to further correct the residual errors to maximum effect.

7.3 Modulator Functional Description

7.3.1 Introduction

The SM5600 Satellite Modulator can be divided into three main sections: the Input card, the Output card assembly, and the Host Controller Card (refer to *Figure 7.3* and *Figure 7.4*).

The standard **Input card** is the DVB Transport Stream Input Interface Card which has DVB ASI and SPI input data interfaces.

The **Output card assembly** comprises a Baseband Card that performs DVB encoding and either a tuneable 50-180 MHz IF Output Card or an L-Band Output Card (available as customer options) that performs the analogue modulation function, frequency conversion, and IF power control.

The **Host Controller Card** includes the main microprocessor control unit responsible for the communication, configuration and monitoring functions performed by the Modulator.

7.3.2 S11340 Host Controller Card

Microprocessor Control

The main microprocessor on the Host Controller Card is responsible for the configuration and monitoring of the entire signal processing chain. It is also responsible for all communication tasks. It supports RS-232/485 remote control, Ethernet control, VT100 terminal control and front panel control. Errors and alarms can be reported via any of the aforementioned interfaces and via a simple RESET/STATUS relay interface.

The embedded software in the Modulator also enables the user to upgrade all of the Software/Firmware in the unit (via FTP) without having to remove the chassis covers. In case of an external error in the data stream or power supply the Modulator will always restore its last working state when all the external errors are cleared. The embedded software controls this recovery. For an explanation of all the control and monitoring features refer to *Chapter 3, Operating the Equipment Locally*.

7.3.3 S11341 DVB Transport Stream Input Interface Card

Transport Stream Interface

The DVB Transport Stream Input Interface Card can receive DVB-compliant MPEG-2 transport streams via either the Synchronous Parallel Interface (SPI) or the two Asynchronous Serial Interfaces (ASI). The user can connect a stream into any of the three interfaces.

It is also possible to connect two inputs; for example, it is possible to connect a stream into both ASI Inputs. This is useful if two distinct distribution systems are available to carry the transport stream from the multiplex source; in case of failure on one distribution system the other will still carry the data to be transmitted. The Modulator can be made to switch if the input in use suffers a failure, although automatic switching is not currently supported.

The Modulator can accept transport streams in two different data formats:

- 188-byte packets, consisting of 188 contiguous data bytes
- 204-byte packets consisting of 188 data bytes and 16 dummy packets

Both the ASI and the SPI streams pass through a digital de-jitter function. This utilises a digital Phase Lock Loop to substantially remove any jitter present on the incoming transport stream. Jitter on the incoming streams is commonly generated by SDH or PDH telecommunications distribution circuits. This jitter must be removed before the DVB-S modulation process.

Additional ASI Information

The encoded line rate of the ASI stream is 270 MBaud \pm 100 ppm. All ASI bytes must be 8B/10B encoded as specified by DVB document A010. Special character commas, K28.5 code words are used as byte synchronisation patterns. Two consecutive K28.5 code words are transmitted prior to each MPEG-2 packet and subsequent K28.5 code words are inserted to pad the data to achieve the required encoded ASI line rate.

The ASI stream can be accepted in either byte mode or single packet burst mode. In byte mode the ASI stream consists of MPEG-2 bytes separated by an approximately constant number of K28.5 code words. In single packet burst mode, the ASI transport stream consists of an entire packet of MPEG-2 data bytes being transmitted and then a series of K28.5 code words until the next packet of data is ready to be transmitted.

The ASI interface inherently generates more jitter than the SPI interface. However, the de-jitter circuitry described above has a sufficiently low bandwidth to regenerate a smooth contiguous data stream from the burst-like ASI data.

7.3.4 IF Output Card Assembly

The IF Output Card Assembly comprises the Baseband Card S10309 and the 50-180 MHz IF Output Card S10310. The DVB-S or DVB-DSNG encoding process is performed on the Baseband Card.

The analogue I and Q data are passed from the Baseband Card to the IF Output Card where I and Q modulation is performed, then frequency down-conversion and finally amplification and gain control.

The I and Q data are digitally filtered on the Baseband Card to provide the required spectrum shaping.

7.3.5 L-Band Output Card Assembly

The L-Band Output Card Assembly comprises the Baseband Card S10309 and the L-Band Output Card S11291. The DVB-S or DVB-DSNG encoding process is performed on the Baseband Card.

The analogue I and Q data are passed from the Baseband Card to the L-Band Output Card where direct I and Q modulation is performed at the output carrier frequency, followed by amplification and gain control.

The I and Q data are digitally filtered on the Baseband Card to provide the required spectrum shaping.

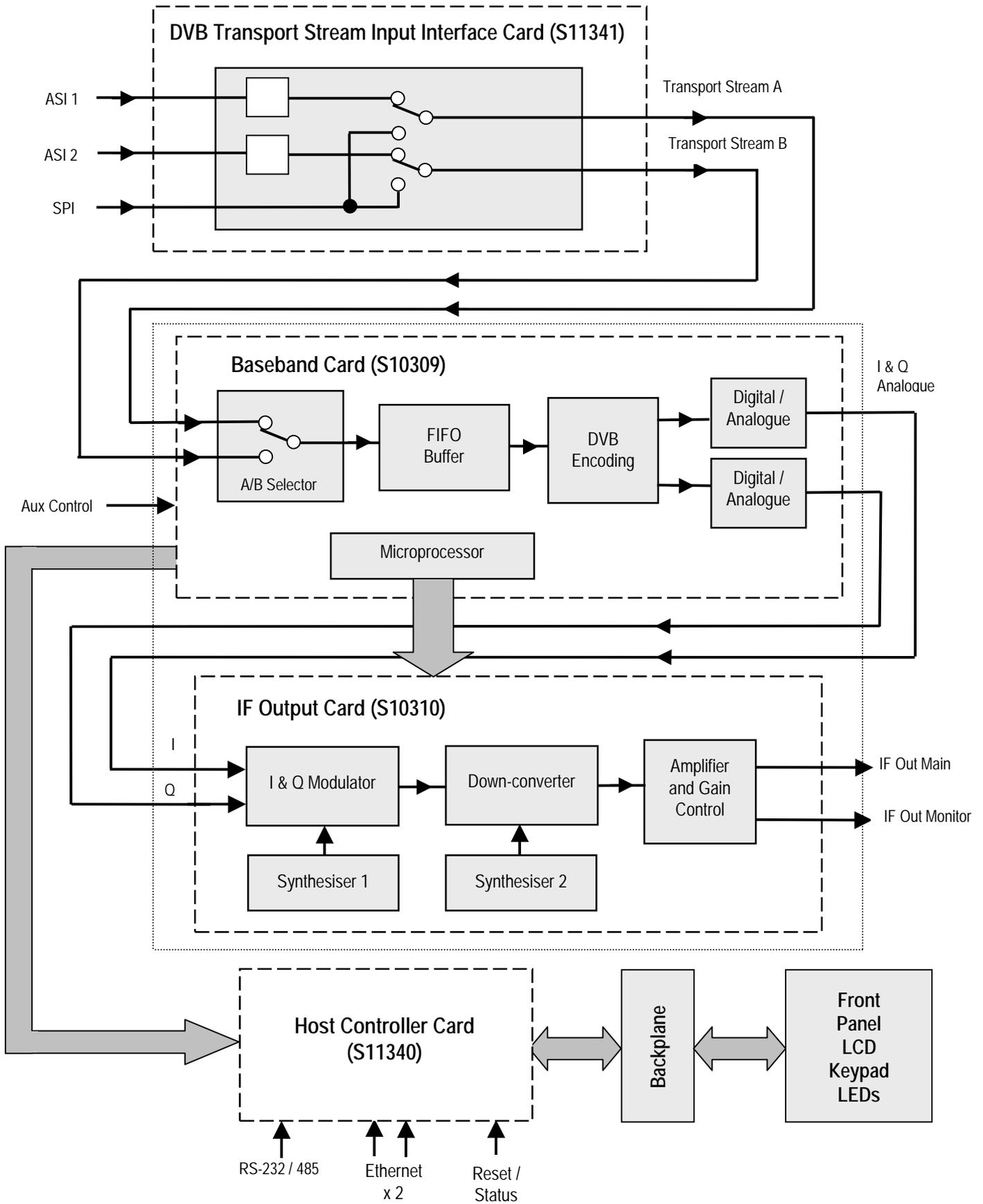


Figure 7.3: Functional Block Diagram – Configuration with IF Output Option

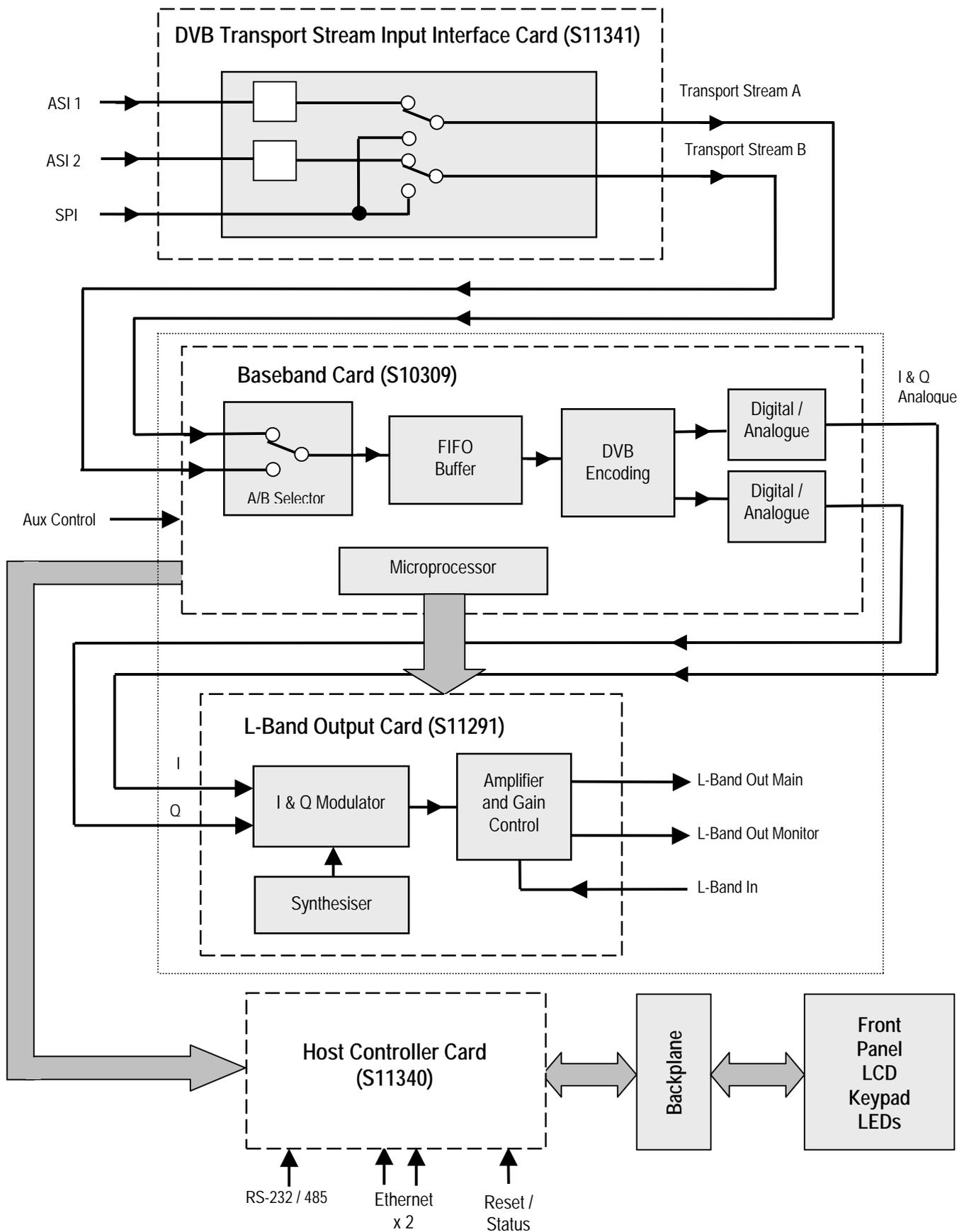


Figure 7.4: Functional Block Diagram – Configuration with L-Band Output Option

Chapter 8

Preventive Maintenance and Fault-finding

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8.1 Introduction

This chapter provides the schedules and instructions, where applicable, for routine inspection, cleaning and maintenance which should be performed by an operator. There are also some basic fault-finding procedures to follow in the event of a suspected SM5600 Satellite Modulator failure.

8.2 Routine Checks

8.2.1 Cooling Fan

There are no routine checks associated with this equipment other than to ensure that the unit is adequately cooled. This equipment must never be operated unless the cooling fans are working; this should be checked periodically.

CAUTION...

The fans contained within this unit are not fitted with insect/dust filters. Pay particular attention to the environment in which it is going to be used.

NOTE...

Failure to ensure a free flow of air around the unit may cause overheating. This condition may be detected by a temperature sensor in the PSU which triggers an automatic shut-down. The PSU does not reset until the temperature has fallen to within normal operational limits.

8.2.2 Cleaning

Unplug the equipment from the supply before cleaning. Do not use liquid or aerosol cleaners. Use a damp cloth for cleaning the exterior of the Modulator.

8.3 Servicing

8.3.1 10 MHz Reference

General

The Modulator employs an OCXO to provide a 10 MHz reference frequency for the internal IF frequency synthesisers. For the IF Output option, the long term frequency drift due to ageing of the OCXO is specified to be less than ± 0.7 ppm per year over the first year and less than ± 4 ppm over ten years. For the L-Band Output option, the long term frequency drift due to ageing of the OCXO is specified to be less than ± 0.1 ppm per year over the first year and less than ± 0.55 ppm over ten years. If necessary, the reference frequency may be re-calibrated by remote control to compensate for ageing.

Adjustment Procedure

1. Set modulation to OFF.
2. Connect a suitable frequency counter to the IF OUT MAIN port to monitor the IF frequency.
3. Set the REF FREQUENCY OFFSET ENABLE parameter to enable and adjust the REFERENCE FREQUENCY OFFSET parameter as required until the desired indication on the frequency counter is obtained. See *Chapter 5, RS-232 Remote Control Protocol* for details of the remote control protocol.

8.3.2 Conditions Requiring Servicing

WARNING

DO NOT ATTEMPT TO SERVICE THIS PRODUCT AS OPENING OR REMOVING COVERS MAY EXPOSE DANGEROUS VOLTAGES OR OTHER HAZARDS. REFER ALL SERVICING TO SERVICE PERSONNEL WHO HAVE BEEN AUTHORISED BY TANDBERG TELEVISION.

The following is a list of conditions which may indicate the need for servicing:

1. When the power-supply cord or plug is damaged.
2. If liquid has been spilled, or objects have fallen into the product.
3. If the product has been exposed to rain or water.
4. If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions, as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
5. If the product has been dropped or the case has been damaged.
6. When the product exhibits a distinct change in performance.
7. If the equipment has been subject to a lightning strike or power surge.

8.3.3 Replacement Parts

When replacement parts are required, be sure only parts specified by TANDBERG Television Limited (or having the same characteristics as the original part) have been used. Unauthorised substitutions may result in fire, electric shock or other hazards.

8.3.4 Checks on Completion of Servicing

Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in a safe operating condition. Also, performance and EMC checks may be required.

8.4 Maintenance and Support Services

8.4.1 Introduction

TANDBERG Television is a leader in the design, integration and implementation of digital broadcasting products and systems. It has a large team dedicated to keeping our customers on-air 24 hours a day, 365 days a year.

With regional offices worldwide, and ultra-modern specialist service facilities in the US, UK, Hong Kong and Australia, TANDBERG Television covers the world. There is a customer service centre open round the clock, every day of the year, in your time zone.

TANDBERG's years of design and support experience enable it to offer a range of service options that will meet your needs at a price that makes sense.

It's called the **TANDBERG Advantage**.

8.4.2 Warranty

All TANDBERG Products and Systems are designed and built to the highest standards and are covered under a comprehensive 12 month warranty.

8.4.3 Levels of Continuing TANDBERG Television Service Support

For stand-alone equipment, then TANDBERG Television **BASIC Advantage** is the value for money choice for you.

BASIC provides you with year-by-year Service long after the warranty has expired.

For systems support you can choose either **Gold** or **Silver Advantage**. These packages are designed to save you costs and protect your income through enlisting the help of TANDBERG Television support specialists.

Call TANDBERG Sales for more details.

8.4.4 Maintenance Philosophy

This chapter provides some basic fault-finding procedures to follow in the event of a suspected Modulator failure. It is assumed that other equipment units have been eliminated as the possible cause of the failure (see relevant documentation).

WARNING...

HAZARDOUS VOLTAGES ARE PRESENT WITHIN THIS EQUIPMENT AND MAY BE EXPOSED IF THE COVERS ARE REMOVED. ONLY TRAINED AND APPROVED SERVICE ENGINEERS ARE PERMITTED TO SERVICE THIS EQUIPMENT.

It is the objective of this chapter to provide sufficient information to enable the rectification of apparent faults by operator action, or else to identify the suspect module, where possible. In the event that the recommended action fails to clear the abnormal condition, call a Service Engineer or contact TANDBERG Television Customer Services (see *Preliminary Pages*).

NOTE...

Unauthorised maintenance or the use of non-approved replacements may invalidate any warranties and/or affect the equipment specification.

8.4.5 Fault Diagnosis for an Operator

Always investigate the failure symptoms fully, prior to taking remedial action. Fault diagnosis for the equipment operator is limited to the following tasks, since the operator should **NOT** remove the covers of the equipment:

1. Check the front panel **Power** LED. If this is not lit:
 - a) Replace external equipment, power source and cables by substitution to check their performance.
 - b) Replace the fuse in the power connector at the rear panel.
2. Confirm that the equipment hardware configuration is suitable for the purpose and has been correctly installed and connected up. Reconfigure/reconnect as necessary.
3. Confirm that inappropriate operator action is not causing the problem, and that the equipment software set-up, via the local terminal, is capable of performing the task being asked of it. Change set-up parameters as necessary.
4. Use the test menus and options provided by the local terminal.
5. Switch off the equipment if it becomes unusable, or to protect it from further damage.
6. Check that the fans are unobstructed and working correctly.

Call a trained and approved Service Engineer or contact Customer Services.

NOTE...

A Modulator **must** be connected to an Encoder or Multiplexer (or otherwise fed with a suitable MPEG-2 transport stream) and monitoring IRD in order to carry out tests in isolation. This may entail removing the stand-by Encoder or Multiplexer from service, if one is available, to enable local diagnostics to be carried out.

8.6 Poor Error Performance

Use the following techniques to fault-find the Modulator when there are a high number of errors in the received signal (video, audio and data may be poor or absent altogether).

Fault-find the problem as detailed in *Table 8.2*.

Table 8.2: Poor Error Performance Fault-finding

Step	Action	If Result of Action is Yes...	If Result of Action is No...
1	Check for Error Messages. Is a fault indicated on the local terminal or computer display?	Fault-find according to the displayed message (see Boot Errors or Alarm and Status Mnemonics as appropriate).	Proceed to next step.
2	Check Modulator and MPEG-2 Data Source Configuration. Are the Modulator and MPEG-2 Data Source Equipment (i.e. Encoder, etc) configured incorrectly?	Configure the Modulator and MPEG-2 Data Source Equipment correctly, paying particular attention to the Input Data Selection (ASI1, etc), Packet Size, Bit -rate, Symbol Rate and FEC Rate settings.	Proceed to next step.
3	Check Modulator Error Correction. Can a lower FEC rate be applied?	Try a more powerful coding rate ($\frac{1}{2}$ is the most powerful).	If the most powerful coding rate is already being used, proceed to next step.
4	Check Modulation Format. Can a more rugged (lower order) modulation format be applied?	Try a more rugged modulation format (BPSK is the most rugged).	If the most rugged modulation format is already being used, proceed to next step.
5	Check Equipment Cabling. Is input/output cable run to/from the Modulator and the next equipment in close proximity to power cables or RFI sources or very long?	Re-route the cables to avoid the possibility of interference from external sources, or relocate the Modulator, or shorten the cables.	Proceed to next step.
6	Check Communications Link. Is the Modulator input or output routed via a modem and a communications link (telephone line, etc).	Check the quality of the communications link and modems.	Possible problem with Modulator, call a Service Engineer.

8.7 Power Supply Problems/LED Unlit

8.7.1 Symptoms

WARNING...

IN THE EVENT OF A POWER SUPPLY FAULT, HAZARDOUS ENERGY LEVELS MAY BE PRESENT ON THE INTERFACES. IF SUCH A FAULT HAS OCCURRED, OR IS SUSPECTED, DO NOT TOUCH ANY EXPOSED WIRES, CONNECTORS OR CIRCUITRY.

Use the following techniques to fault-find the Modulator according to the observed symptom(s) when a power supply failure is suspected.

8.7.2 Power LED Unlit

When the Modulator Power LED is unlit, fault-find the problem as detailed in *Table 8.3*.

Table 8.3: Power LED Unlit Fault-finding

Step	Action	If Result of Action is Yes...	If Result of Action is No...
1	Check Power LED. Is the Modulator still working?	If the Modulator is clearly working normally then the Power LED itself is probably at fault. Call a Service Engineer.	Proceed to next step.
2	Check AC Power Source. Connect a known-working piece of equipment to the power source outlet. Does it work?	The problems lies within the Modulator or power cable. Proceed to next step.	The problem lies with the ac power source. Check building circuit breakers, fuse boxes, etc. If problem persists, contact the electricity supplier.
3	Check Power Cable and Fuse. Unplug the power connector from the Modulator and try it in another piece of equipment. Does it work?	The problems lies within the Modulator. Proceed to next step.	The problem lies either with the cable itself, or with the fuse in the plug. Replace the fuse or try another cable.
4	Check PSU Module and Fuse. Ensure the power connector is unplugged. Remove the fuse from the rear panel connector and inspect it. Has the fuse blown?	Replace the fuse with one of the correct type and rating (see <i>Annex B Technical Specification</i>). If the PSU still does not work, unplug the power cable and call a Service Engineer.	Possible problem with the PSU module, call a Service Engineer.

NOTE...

The PSU contains over-temperature sensing circuitry which shuts down the Modulator in the event of overheating.

8.7.3 Fan(s) Not Working/Overheating

This equipment is forced air-cooled and must not be operated unless all cooling fans are working. In the event of overheating problems, refer to *Table 8.4*.

NOTE...
 Failure to ensure a free air flow around the unit may cause overheating. This may be detected by the PSU and trigger an automatic shut-down. The PSU does not reset until the temperature is within normal operational limits.

Table 8.4: Fans Not Working/Overheating

Step	Action	If Result of Action is Yes...	If Result of Action is No...
1	Check Air Inlets/Outlets. Blocked air inlets/outlets could restrict the flow of air and lead to overheating. Are the air inlets/outlets clear?	Proceed to next step.	Switch the equipment off and unblock the air inlets/outlets.
2	Check Fan Rotation. Inspect the fans located at the sides of the enclosure. Are the fans rotating?	Check that the Modulator has been installed with sufficient space allowed for air flow (see <i>Chapter 2, Installation</i>). If the ambient air is too hot, additional cooling may be required.	Possible break in the dc supply from the PSU module to the suspect fan(s). Call a Service Engineer.

8.8 VT100 Terminal Emulation Program Problems

Ensure that the terminal emulation program is set up correctly. See *Section 3.1.2, Setting up the VT100 Terminal Emulation Program* for the complete procedure.

8.9 Alarm and Failure Reporting

8.9.1 Introduction

This section describes the alarm and fail conditions which cause the alarm/fail relays to be actuated and which are recorded in the Alarm log. They are dependent on the cards fitted and, in some cases, the mode of operation of the Modulator. The alarms reported are dependent upon the Alarm Mask settings. See *Section 3.5.2* for further details.

This section defines the alarm reporting scheme implemented in version 2.1 and later of the SM5600 Satellite Modulator software.

8.9.2 Alarm Severity Levels

Each alarm is assigned one of six severity levels. These levels provide an indication of how it is perceived that the capability of the Modulator has been affected. Those severity levels which represent service affecting conditions ordered from most severe to least severe are **critical**, **major**, **minor** and **warning**. The six severity levels are defined below.

1. The **cleared** severity level indicates the clearing of one or more previously reported alarms. This alarm clears all alarms for the Modulator that have the same alarm type, probable cause and specific problems (if given).
2. The **indeterminate** severity level indicates that the severity level cannot be determined.
3. The **critical** severity level indicates that a service affecting condition has occurred and an immediate corrective action is required. Such a severity can be reported, for example, when the Modulator becomes totally out of service and its capability must be restored.
4. The **major** severity level indicates that a service affecting condition has developed and an urgent corrective action is required. Such a severity can be reported, for example, when there is a severe degradation in the capability of the Modulator and its full capability must be restored.
5. The **minor** severity level indicates the existence of a non-service affecting fault condition and that corrective action should be taken in order to prevent a more serious (for example, service affecting) fault. Such a severity can be reported, for example, when the detected alarm condition is not currently degrading the capacity of the Modulator.
6. The **warning** severity level indicates the detection of a potential or impending service affecting fault, before any significant effects have been felt. Action should be taken to further diagnose (if necessary) and correct the problem in order to prevent it from becoming a more serious service affecting fault.

8.9.3 SM5600 Alarm Groups

The alarm text and severity levels for all SM5600 alarms are defined in this section.

Alarms are divided into four groups according to their source:

- Alarms sourced by the Host card (slot number 3)
- Alarms sourced by the Input card (slot number 4)
- Alarms sourced by the Baseband card (slot number 2)
- Alarms sourced by the IF card (slot number 1)

Each alarm is capable of being masked. See *Section 3.5.2* for further details.

8.9.4 Host Card (Slot 3) Alarms

The alarms sourced by the Host card are listed in *Table 8.5* These include general equipment alarms detected by the Host card as well as those originating from the Host card itself.

Table 8.5: Host Card Alarms

Terminal Alarm Message	Front Panel Alarm Message	Severity Level
Booting	Booting	Critical
Test Mode	Test Mode	Critical
No Input Card	No Input Card	Critical
No Baseband Card	No Baseband Card	Critical
No IF Card	No IF Card	Critical
3V3 PSU Voltage Low	3V3 PSU Voltage Low	Critical
3V3 PSU Voltage High	3V3 PSU Voltage High	Critical
5V PSU Voltage Low	5V PSU Voltage Low	Critical
5V PSU Voltage High	5V PSU Voltage High	Critical
+15V PSU Voltage Low	+15V PSU Voltage Low	Critical
+15V PSU Voltage High	+15V PSU Voltage High	Critical
-15V PSU Voltage Low	-15V PSU Voltage Low	Critical
-15V PSU Voltage High	-15V PSU Voltage High	Critical
Backplane not Responding	Backplane Error	Critical
Baseband Card not Responding	Baseband Card Error	Critical
Input Card not Responding	Input Card Error	Critical
Flat Battery	Flat Battery	Warning
Flash Memory Program Fail	Host Flash Fail	Critical
Self Test Fail	Self Test Fail	Critical
Temperature Low	Temperature Low	Warning
Temperature High	Temperature High	Warning
No Licence Keys Installed	No Licence Keys	Warning
Uplink Fade Control Error	Uplink Fade Ctl Error	Major

8.9.5 Input Card (Slot 4) Alarms

The alarms sourced by the Input card are listed in *Table 8.6*.

Table 8.6: Input Card Alarms

Terminal Alarm Message	Front Panel Alarm Message	Severity Level
Input Fail	Input Fail	Critical
Input Packet Size Error	Input Pkt Size Error	Critical

8.9.6 Baseband Card (Slot 2) Alarms

The alarms sourced by the Baseband card are listed in *Table 8.7*.

Table 8.7: Baseband Card Alarms

Terminal Alarm Message	Front Panel Alarm Message	Severity Level
Hardware Fail	Hardware Fail	Critical
FPGA Configuration Fail	FPGA Config Fail	Critical
FPGA Temperature High	FPGA Temp High	Critical
FPGA Clock Unlocked	FPGA Clock Unlocked	Critical
Calibration Fail	Calibration Fail	Major
Modulator Core Reset	Modulator Core Reset	Critical
Modulation Fail	Modulation Fail	Critical
Clock Fail	Clock Fail	Critical
Sync Fail	Sync Fail	Critical
TSI FIFO Under/Overflow	TSI FIFO Level Error	Critical
DPC FIFO Under/Overflow	DPC FIFO Level Error	Critical
Host Control Disabled	Host Control Disabled	Indeterminate
Parameter Fault	Parameter Fault	Critical
I2C Bus Error	I2C Bus Error	Minor
Beacon Signal Fail	Beacon Signal Fail	Critical
Flash Memory Program Fail	Flash Program Fail	Critical
Download Fail	Download Fail	Critical

8.9.7 IF Card (Slot 1) Alarms

The alarms sourced by the IF card are listed in *Table 8.8* and *Table 8.9*.

Table 8.8: IF Card Alarms – Configuration with IF Output Option

Terminal Alarm Message	Front Panel Alarm Message	Severity Level
IF Carrier Frequency Unlocked	IF Carrier Frequency Unlocked	Critical
IF Power Level Error	IF Power Level Error	Major
IF Output Muted	IF Output Muted	Critical

Table 8.9: IF Card Alarms – Configuration with L-Band Output Option

Terminal Alarm Message	Front Panel Alarm Message	Severity Level
IF Carrier Frequency Unlocked	IF Carrier Frequency Unlocked	Critical
IF Output Muted	IF Output Muted	Critical
Up-converter Power Shutdown	UpConv Power Shutdown	Major

8.9.8 Front Panel Alarm LED

The red front panel Alarm LED is lit when any unmasked alarm condition exists.

NOTE...

The front panel display indicates the alarm severity level by using a numeric index. These are described under *Alarm Severity Levels* on page 8-10.

8.9.9 Alarm and Fail Relays

The alarm and fail relay contacts (described under *Signal Connections* in *Chapter 2, Installing the Equipment*) are driven by the equipment's alarms and warnings. *Table 8.10* shows the effect of masking on the relays and the Alarm LED.

Table 8.10: Effect of Masking the Fail and Alarm Conditions

Mask	Relay	Alarm LED
Off	None	-
Alarm	Alarm	✓
Fail	Alarm + Fail	✓

8.10 Event Reporting

Table 8.11 lists the Event Log entries. See *Chapter 3, Section 3.8.2 Log Menu Option 2: View Event History* for details.

Table 8.11: Event Log Entries

Log Entry	Description
Alarm Log Reset	The alarm log was reset
Configuration Store Reset	The configuration store has been reset
DPC Profiles Reset	All DPC profiles reset to null correction
Event Log Reset	The event log was cleared
Failed To Boot Correctly	The Modulator failed to boot correctly
File Sent By Modulator	Files were downloaded via FTP from the Modulator
Files Received By Modulator	Files were uploaded via FTP to the Modulator
FTP Connection Closed	An FTP session was closed
FTP Connection Opened	An FTP connection request was received
FTP User Failed To Log In	An FTP user attempted to login, but failed
FTP User Logged In	A user logged in via FTP
Logs Reset-Flat Battery	The logs have been reset due to the battery being flat
Modulator Stopped	
Net Config Changed	The network parameters were changed
New Configuration Saved	A new configuration has been saved
NVRAM Reset – Corruption	The logs have been reset due to corruption
Self Test Failed	The self-test failed
Stored Config Deleted	A stored configuration has been reset
Stored Configs Updated	One of the stored configuration was updated
System Entered A Test Mode	The Modulator started executing a test
System Exited Test Mode	The Modulator finished executing a test

Log Entry	Description
Telnet User Logged In	A user has logged in via Telnet
Telnet User Logged Out	A telnet user logged out
Telnet User Login Failed	A telnet user failed to log in
Temperature Log Reset	The temperature log has been reset
User Requests A Restart	
Modulator Restarted	The Modulator rebooted
Time Updated From Network	The real time clock was updated from a network time server
Time Changed By User	A user changed the real time clock
Unknown Log Entry	The log entry is unknown.
User Accounts Updated	User accounts have been modified

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Chapter 9

File Transfer Protocol (FTP)

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9.1 File Transfer Protocol (FTP)

9.1.1 Introduction

CAUTION...

Only one logical control interface on the Modulator, i.e. Front Panel, Terminal, SNMP Remote Control, FTP, etc, should be used at any one time. Using more than one interface simultaneously may cause unexpected behaviour of the Modulator.

The SM5600 Satellite Modulator provides a File Transfer Protocol (FTP) interface which is primarily used for code and firmware updates. It is also used for retrieving logs and configurations as well as uploading configurations.

Any FTP program may be used to access the Modulator's FTP server. However, it should be noted that the Modulator will only allow one logon at a time and many graphical FTP clients use multiple logons. The sample screens given in this chapter were obtained using the FTP client shipped with Microsoft Windows.

NOTE...

The Modulator uses a reduced instruction set of standard FTP commands.

9.1.2 FTP Interface

To FTP to the Modulator, FTP Logon privilege is required. A typical logon screen is as follows:

```
C:\>ftp 172.16.250.180
Connected to 172.16.250.180.
220 Tandberg Television SM5600 Satellite modulator ready for user ...
User (172.16.250.180:(none)): root
331 Password required for user root.
Password:
230-Modulator identity:
230-DVT 1
230 User logged in.
ftp>
```

When logged on, the Modulator returns its identity which can be set from the terminal interface described in *Chapter 3, Operating the Equipment Locally*.

The FTP server responds to the normal `dir` and `ls` commands. The top-level directory is as follows:

```
ftp> dir
200 Set port to 172.16.195.10:1220.
150 opening data connection
drw-rw-rw- 1 system      system          0 APR 26 07:46 software
drw-rw-rw- 1 system      system          0 APR 26 07:46 logs
drw-rw-rw- 1 system      system          0 APR 26 07:46 config
drw-rw-rw- 1 system      system          0 APR 26 07:46 dpc
drw-rw-rw- 1 system      system          0 APR 26 07:46 firmware
drw-rw-rw- 1 system      system          0 APR 26 07:46 webserver
drw-rw-rw- 1 system      system          0 APR 26 07:46 keys
226 transfer complete.
462 bytes received in 0.01 seconds (46.20 Kbytes/sec)
ftp>
```

The format of the **dir** results reflect the FTP specification. The **User** is the name of the user that last changed the file - or **system** for fixed or read-only files and directories.

The **group** is used to indicate the version number of the file, or one of the following for files that have no version:

```
cfg      -      Configuration file
log      -      Log file
```

9.1.3 The Software Directory

This directory contains the software for the Modulator. To enter the software directory type **cd /software**.

```
ftp> cd /software
250 software/
ftp> dir
200 Set port to 172.16.195.10:1222.
150 opening data connection
--w--w--w- 1 root      V03.01      1170701 NOV 13 09:27 active_app.hex
--w--w--w- 1 root      V01.00      27585  AUG 13  2001 monitor.hex
--w--w--w- 1 system    system      0 APR 26 07:46 minapp.hex
--w--w--w- 1 root      V03.01      1170701 NOV 13 09:27 app.hex
--w--w--w- 1          s10309      999999 MAY 14 11:11 boot.hex
--w--w--w- 1          s10309      999999 MAY 14 11:11 ctl.hex
226 transfer complete.
423 bytes received in 0.04 seconds (10.57 Kbytes/sec)
ftp>
```

The file **active_app.hex** is the current main application code for the Modulator. **Monitor.hex** is the start up code for the Host card. **Minapp.hex** is the reduced application code (not currently supported). **App.hex** is the backup application code. **Boot.hex** is the boot code for the Baseband card, and **ctl.hex** is the Baseband control code.

NOTE...
The contents of this directory depend on the users access rights and the options fitted.

It is not possible to retrieve software files from the Modulator.

9.1.4 The Firmware Directory

This directory contains data which is loaded into the FPGA devices within the Modulator. To enter the firmware directory type **cd /firmware**. Typical firmware directory contents are as follows:

```
ftp> cd /firmware
250 firmware/
ftp> dir
200 Set port to 172.16.195.1135.
150 opening data connection
--w--w--w- 1          s10309          999999 MAY 14 11:16 dsp.hex
--w--w--w- 1          s10309          999999 MAY 14 11:16 rnf.hex
--w--w--w- 1          s10309          999999 MAY 14 11:16 dpca.hex
--w--w--w- 1          s10309          999999 MAY 14 11:16 dpcb.hex
--w--w--w- 1          s10309          999999 MAY 14 11:16 rnfilter.hex
226 transfer complete.
343 bytes received in 0.03 seconds (11.43 Kbytes/sec)
ftp>
```

The above files are firmware files for the Modulator Baseband Card.

9.1.5 The Logs Directory

This directory contains the logs kept by the Modulator. These are the same logs as those viewed on the terminal described in *Chapter 3, Operating the Equipment Locally*.

```
ftp> cd /logs
250 logs/
ftp> dir
200 Set port to 172.16.195.10:1223.
150 opening data connection
-r--r--r-- 1 system  log          47352 MAY 22 12:05 event.log
-r--r--r-- 1 system  log          14880 MAY 22 10:44 alarm.log
-r--r--r-- 1 system  log           202 MAY 22 12:20 temp.log
226 transfer complete.
275 bytes received in 0.77 seconds (0.36 Kbytes/sec)
ftp>
```

The file **event.log** is the Event log, **alarm.log** is the alarm log and **temp.log** is the temperature log.

NOTE...

The data for these logs is held in a compressed format, and when viewing a directory the logs are uncompressed to calculate the file size which may take a few seconds.

Log files may be retrieved by using the **get** command.

```
ftp> get event.log
200 Set port to 172.16.195.10:1224.
150 opening data connection
226 Transfer complete.
48351 bytes received in 0.95 seconds (50.84 Kbytes/sec)
ftp>
```

The log files may be reset by using the **del** command.

```
ftp> del event.log
250 File successfully deleted.
ftp>
```

Doing this is exactly the same as doing reset event log from the terminal, as described in *Chapter 3, Operating the Equipment Locally*.

9.1.6 The Config Directory

Contents of the Directory

The **config** directory contains the nine stored configurations as well as the active configuration. It also holds the Ethernet configuration and version information.

The **active.cfg** file holds the currently implemented configuration and cannot be deleted. Also, neither the **ethernet.cfg** nor the **version.cfg** files can be deleted. All other configuration files can be deleted.

```
ftp> cd /config
250 config/
ftp> dir
200 Set port to 172.16.195.10:1226.
150 opening data connection
-r--r--r-- 1 AnyUser   cfg           545 MAY 22 11:14 active.cfg
-rw-rw-rw- 1 system    cfg           545 MAY 22 12:31 config01.cfg
-rw-rw-rw- 1          cfg           34  MAR 25 10:05 config02.cfg
-rw-rw-rw- 1          cfg           34  MAR 25 10:05 config03.cfg
-rw-rw-rw- 1          cfg           34  MAR 25 10:05 config04.cfg
-rw-rw-rw- 1 root      cfg           548 MAY 04 16:35 config05.cfg
-rw-rw-rw- 1          cfg           34  MAR 25 10:05 config06.cfg
-rw-rw-rw- 1          cfg           34  MAR 25 10:05 config07.cfg
-rw-rw-rw- 1          cfg           34  MAR 25 10:05 config08.cfg
-rw-rw-rw- 1 system    cfg           547 MAR 25 10:05 config09.cfg
-r--r--r-- 1 system    cfg           228 MAY 22 12:32 ethernet.cfg
-r--r--r-- 1 system    cfg           1578 MAY 22 12:32 version.cfg
226 transfer complete.
861 bytes received in 0.13 seconds (6.62 Kbytes/sec)
ftp>
```

Typical Config Files

config01.cfg (or any config file)

The following illustration shows a typical configuration file.

```

Config 1      Name:  Firstly

Input Selection :  ASI 1
Packet Size    :  204 bytes
Error Flag     :  OFF
Bit-rate      :  30.000000 Mbit/s
Symbol Rate   :  20.000000 Msym/s
Coding Mode    :  DVB
Modulation Format:  QPSK
FEC Rate      :  3/4
Roll-off      :  35 %
IF Frequency   :  70.000 MHz
IF Power      :  -4.0 dBm
IF Output     :  ON
Mod State     :  ON
Spectrum Sense :  Normal
DPC Control   :  OFF

```

ethernet.cfg

The following illustration shows a typical Ethernet configuration file.

```

IP Address    :  172.16.250.180
Subnet mask   :  255.255.0.0
Gateway IP    :  0.0.0.0
Gateway       :  Disabled
MAC Address   :  00:20:AA:14:00:0A
Time Server IP :  0.0.0.0
Time Protocol :  SNTP
Time Server   :  Disabled

```

version.cfg

```

TANDBERG Television SM5600 Satellite Modulator
Identifying Name           :  Merlin
Unit Inventory Serial No.  :  9234
Unit Initialisation Date   :  APR 26 2002 07:46:17
Last Boot Time             :  May 10 2002 15:02:29

Controller Card
PCB Revision               :  3
Modification Status       :  0
Serial No.                 :  00080014DDDF3
Firmware Version          :  1.1
Boot Software Version      :  01.00
Main Software Version      :  03.01
Web Site Version          :  01.03

```

Backplane	
PCB Revision	: 2
Modification Status	: 0
Firmware Version	: 1.1
Modulator Baseband Card	
Card Type	: S10309
PCB Revision	: 5
Modification Status	: 0
Serial No.	: 000800116965
CPLD Firmware Version	: 1.4
DSP Firmware Version	: 1.1
RNF Firmware Version	: 1.0
Software Version	: 1.0
Modulator IF Card	
Card Type	: S10310
PCB Revision	: 3
Modification Status	: 0
Serial No.	: 000800114E24
Firmware Version	: 1.1
DPC Card	
Card Type	: Not fitted
Input Card	
Card Type	: S11341
PCB Revision	: 3
Modification Status	: 0
Serial No.	: 00080014D757
Firmware Version	: 1.2
Licence Key Features	
Enabled Features	: None

Downloading Configurations

It is possible to download configurations to the Modulator using FTP. Any of the nine stored configurations may be changed. The currently implemented configuration, active.cfg, may not be changed in this way.

To download a configuration, a configuration file must be prepared in a specific format for the Modulator to understand. It is recommended that a configuration file is retrieved from the Modulator as a starting point.

The format is as follows:

```
parameter name:value
```

Exiting FTP Session

To exit the FTP session type **bye** or **quit** then press **Enter**.

```
ftp> bye
221 Closing connection ... goodbye.

C:\>
```

9.1.7 Connecting to a Web Browser

Many Web browsers, such as Microsoft Internet Explorer and Netscape Navigator, support FTP. It is possible to access the Modulator using FTP from a browser. Access is limited to retrieving log, configuration and Dynamic Pre-corrector files.

To connect to the Modulator via a Web browser, use the following address format:

```
ftp://<user>:<password>@<IP Address>
```

Replace <user> with your user name, <password> with your password, and <IP Address> with the address of the Modulator. For example, the following address will connect the root user to a Modulator on address 172.16.250.180:

```
ftp://root:root@172.16.250.180
```

CAUTION...

Most WEB browsers keep a history of pages visited. To prevent others from finding your user name and password for the Modulator, be sure to clear the history after use.

9.1.8 Microsoft Internet Explorer

Typical Internet Explorer Display

A typical display from Microsoft Internet Explorer is shown in *Figure 9.1*. Internet Explorer does not display the user and group information. To access the directories click on the underlined names.

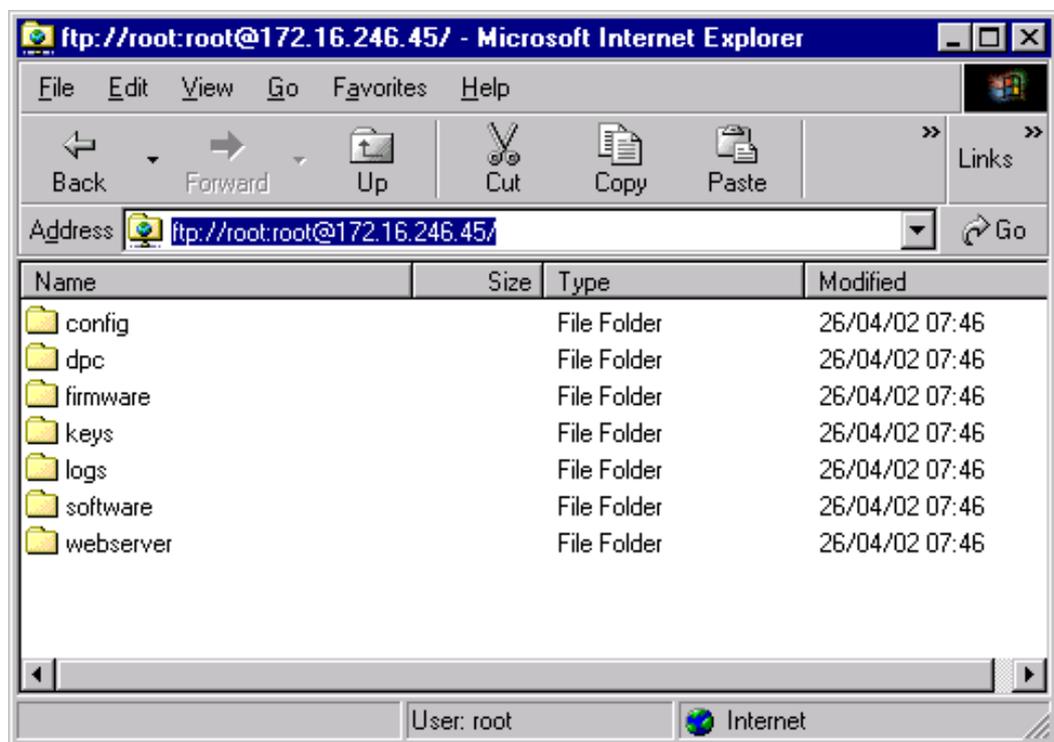


Figure 9.1: Microsoft Internet Explorer Typical Display

Downloading a File

To download a file from the Modulator, click on the file. This will display a download confirmation window, as shown in *Figure 9.2*.

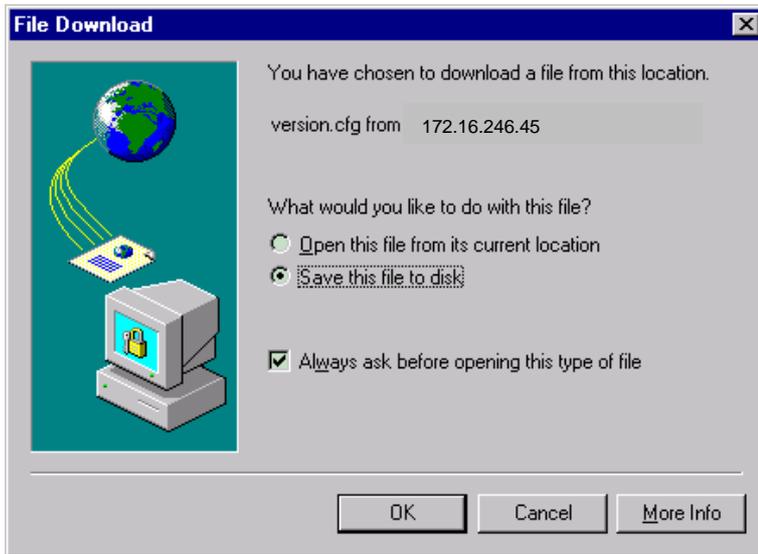


Figure 9.2: Typical File Download Screen

Click **OK** to continue with the download. You will then be asked to select a location to save the file.

9.1.9 Netscape Navigator

A typical display from Netscape Navigator is shown in *Figure 9.3*.

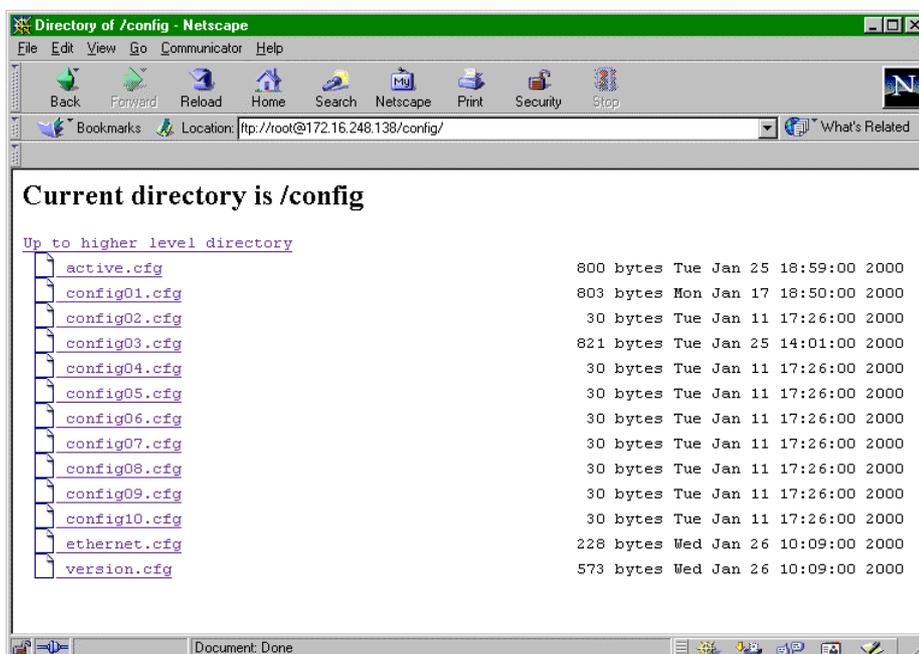


Figure 9.3: Netscape Navigator Typical Display

Chapter 10

Licence Keys

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10.1 Introduction

Certain functionality of the Modulator is dependent upon which options have been purchased by the customer. Functionality is enabled or disabled by means of licence keys installed in the Modulator. A licence key is a string of numbers which, when downloaded to a Modulator, will enable a specific feature or set of features.

Licence keys may be installed by the user, allowing field upgrading of Modulators to be performed simply.

10.2 Obtaining Licence Keys

Licence keys can be purchased from your local TANDBERG Television sales representative. To obtain a key or keys, specify the options required plus the serial numbers of the Modulators. These can be obtained from the Terminal or FTP interfaces. Below is a typical version information screen from the terminal:

```

Identifying Name           : Merlin
Unit Inventory Serial No.  : 9234
Unit Initialisation Date   : APR 26 2002 07:46:17
Last Boot Time             : May 10 2002 15:02:29

Controller Card
  PCB Revision              : 3
  Modification Status       : 0
  Serial No.                : 00080014DDF3
  Firmware Version          : 1.1
  Boot Software Version     : 01.00
  Main Software Version     : 03.01
  Web Site Version          : 01.03

Backplane
  PCB Revision              : 2
  Modification Status       : 0
  Firmware Version          : 1.1

Modulator Baseband Card
  Card Type                 : S10309
  PCB Revision              : 5
  Modification Status       : 0
  Serial No.                : 000800116965
  CPLD Firmware Version     : 1.4
  DSP Firmware Version      : 1.1
  RNF Firmware Version      : 1.0
  Software Version          : 1.0

Modulator IF Card
  Card Type                 : S10310
  PCB Revision              : 3
  Modification Status       : 0
  Serial No.                : 000800114E24
  Firmware Version          : 1.1

DPC Card

```

```

Card Type                : Not fitted

Input Card
Card Type                : S11341
PCB Revision             : 3
Modification Status      : 0
Serial No.               : 00080014D757
Firmware Version         : 1.2

Licence Key Features
Enabled Features         : None

Press Enter to continue

```

To ensure the correct licence key is generated, this entire file should be supplied. Licence keys will be sent via email.

A single key can enable more than one feature, but will only work on a single Modulator. When keys are ordered for several Modulators a number of keys will be supplied as a licence key file.

10.3 Entering Single Licence Keys

10.3.1 Single Key

When a single key is requested, it may be entered via the FTP interface.

10.3.2 FTP Entry

Save the emailed key to a file called **licence.dat** and download to the keys directory. An example session is shown as follows:

```

C:\>ftp 172.16.246.45
Connected to 172.16.246.45.
220 TANDBERG Satellite Modulator SM5600
User (172.16.248.137: (none)): root
331 Password required for user root.
Password:
230-Modulator identity:
230-Merlin
230 User logged in.
ftp> cd keys
250 keys/
ftp> put licence.dat
200 Set port to 172.16.195.131:1174.
150 opening data connection
226-16QAM: Enabled
226 Transfer complete.
90 bytes sent in 0.00 seconds (90000.00 Kbytes/sec)
ftp>bye

```

10.4 Entering Multiple Licence Keys

The process of entering several keys is the same as for a single key. Entering keys intended for several Modulators to a single unit does not cause a problem as keys intended for other Modulators are ignored.

For example, if a system consists of 10 Modulators and they are all to be upgraded to include 16QAM modulation, a large licence key file will be supplied. This file can be downloaded to all the Modulators within the system.

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Annex A

Glossary

The following list covers most of the abbreviations, acronyms and terms as used in TANDBERG Television Limited Manuals. All terms may not be included in this manual.

µm	Micrometre (former name - micron): a unit of length equal to one millionth (10^{-6}) of a metre.
3:2 pulldown	A technique used when converting film material (which operates at 24 pictures per second) to 525-line video (operating at 30 pictures per second).
4:2:0	Digital video coding method in which the colour difference signals are sampled on alternate lines at half the luminance rate.
4:2:2	Digital video coding method in which the colour difference signals are sampled on all lines at half the luminance rate.
422P@ML	422 Profile at Main Level: A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 50 Mbit/s over various mediums. Used for Contribution and Distribution applications.
5B6B	5 Binary Bits Encoded to 6 Binary Bits: Block code.
AC-3	Audio Coding algorithm number 3 (See Dolby Digital).
ACC	Authorisation Control Computer.
ADPCM	Adaptive Differential Pulse Code Modulation: An advanced PCM technique that reduces the bit-rate by coding the difference values between successive samples rather than the absolute value of each sample.
ADT	Audio, Data And Teletext.
AFC	Automatic Frequency Control.
AFS	Automation File Server.
AGC	Automatic Gain Control.
AMOL I and II	Automatic Measure of Line-ups I and II: Used by automated equipment to measure programme-viewing ratings.
ASI	Asynchronous Serial Interface.
ASIC	Application-Specific Integrated Circuit: A customised chip designed to perform a specific function.
Async	Asynchronous.
ATM	Asynchronous Transfer Mode: A connection orientated, cell based, data transport technology designed for Broadband ISDN (B-ISDN). It provides a circuit-switched bandwidth-on-demand carrier system, with the flexibility of packet switching. It offers low end-to-end delays and (negotiable on call set-up) Quality of Service guarantees. Asynchronous refers to the sporadic nature of the data being transmitted. Cells are transmitted only when data is to be sent; therefore the time interval between cells varies according to the availability of data.
ATSC	Advanced Television Standards Committee: An organisation founded in 1983 to research and develop a digital TV standard for the U.S.A. In late 1996, the FCC adopted the ATSC standard, the digital counterpart of the NTSC standard.

B3ZS	Bipolar with Three Zero Substitution: A method of eliminating long zero strings in a transmission. It is used to ensure a sufficient number of transitions to maintain system synchronisation when the user data stream contains an insufficient number of 1s to do so. B3ZS is the North American equivalent of the European HDB3.
Backward Compatibility	Refers to hardware or software that is compatible with earlier versions.
BAT	Bouquet Association Table: Part of the service information data. The BAT provides information about bouquets. It gives the name of the bouquet and a list of associated services.
baud rate	The rate of transfer of digital data when the data comprises information symbols that may consist of a number of possible states. Equivalent to bit-rate when the symbols only have two states (1 and 0). Measured in Baud.
BER	Bit Error Rate: A measure of transmission quality. The rate at which errors occur in the transmission of data bits over a link. It is generally shown as a negative exponent, (e.g. 10^{-7} means that 1 in 10,000,000 bits are in error).
BISS	Basic Interoperable Scrambling System: Non-proprietary encryption from EBU (Tech3290).
Bit-rate	The rate of transfer of digital data when the data comprises two logic states, 1 and 0. Measured in bit/s.
Block; Pixel Block	An 8-row by 8-column matrix of luminance sample values, or 64 DCT coefficients (source, quantised, or dequantised).
Bouquet	A collection of services (TV, radio, and data, or any combination of the three) grouped and sold together, and identified in the SI as a group. A single service may be in several bouquets.
B-Picture; B-Frame	Bi-directionally Predictive Coded Picture/Frame: A picture that is coded using motion-compensated prediction from previous I or P frames (forward prediction) and/or future I or P frames (backward prediction). B frames are not used in any prediction.
BPSK	Binary Phase Shift Keying: A data modulation technique.
Buffer	A memory store used to provide a consistent rate of data flow.
BW	Bandwidth: The transmission capacity of an electronic line such as (among others) a communications network, computer bus, or broadcast link. It is expressed in bits per second, bytes per second or in Hertz (cycles per second). When expressed in Hertz, the frequency may be a greater number than the actual bits per second, because the bandwidth is the difference between the lowest and highest frequencies transmitted. High bandwidth allows fast transmission or high-volume transmission.
Byte-mode	Each byte is delivered separately in the ASI Transport Stream, with stuffing data added between the Bytes to increase the data rate to 270 Mbit/s. See DVB Document A010 rev. 1, Section B3.3, (ASI) Layer-2 Transport Protocol.
CA	Conditional Access: The technology used to control the access to viewing services to authorised subscribers through the transmission of encrypted signals and the programmable regulation of their decryption by a system such as viewing cards.
CAT	Conditional Access Table: Part of the MPEG-2 Program Specific Information (PSI) data. Mandatory for MPEG-2 compliance if CA is in use.
C-Band	The portion of the electromagnetic spectrum, which spans the frequency range of approximately 4 GHz to 6 GHz. Used by communications satellites. Preferred in tropical climates because it is not susceptible to fading.
CCIR	See: ITU-R.
CCITT	See: ITU-T.
Channel	A narrow range of frequencies, part of a frequency band, for the transmission of radio and television signals without interference from other channels. In the case of OFDM, a large number of carriers spaced apart at precise frequencies are allocated to a channel.
Channel Coding	A way of encoding data in a communications channel that adds patterns of redundancy into the transmission path in order to improve the error rate. Such methods are widely used in wireless communications.
Chrominance	The colour part of a TV picture signal, relating to the hue and saturation but not to the luminance (brightness) of the signal. In a composite-coded colour system, the colour information (chrominance, often referred to as chroma) is modulated onto a high frequency carrier and added to the monochrome-format video signal carrying the luminance (Y). In a component-coded colour system, the two colour-difference signals (R-Y)(B-Y) usually referred to as C_{RCB} (digital) or P_{RPB} (analogue), are used to convey colour information. When C_{RCB} (P_{RPB}) is added to the luminance (Y), the complete picture information is conveyed as YC_{RCB} (YP_{RPB}).
Closed Captioning	A TV picture subtitling system used with 525-line analogue transmissions.
CODE	Create Once Distribute Everywhere.
Codec	The combination of an Encoder and a complementary Decoder located respectively at the input and output of a transmission path.
COFDM	Coded OFDM: COFDM adds forward error correction to the OFDM transmission consisting of Reed-Solomon (RS) coding followed by convolutional coding to add extra bits to the transmitted signal. This allows a large number of errors at the receive end to be corrected by convolutional (Viterbi) decoding followed by RS decoding.

Compression	Reduction in the number of bits used to represent the same information. For the purposes of a broadcast system, it is the process of reducing digital picture information by discarding redundant portions of information that are not required when reconstituting the picture to produce viewing clarity. Compression allows a higher bite-rate to be transmitted through a given bandwidth.
Compression System	Responsible for compressing and multiplexing the video / audio / data bit-streams, together with the authorisation stream. The multiplexed data stream is then ready for transmission.
CrCb	Digital Colour difference signals. These signals, in combination with the luminance signal (Y), define the colour and brightness of each picture element (pixel) on a TV line. <i>See:</i> Chrominance
CRC	Cyclic Redundancy Check: A mathematical algorithm that computes a numerical value based on the bits in a block of data. This number is transmitted with the data and the receiver uses this information and the same algorithm to ensure the accurate delivery of data by comparing the results of algorithm and the number received. If a mismatch occurs, an error in transmission is presumed.
CVCT	Cable Virtual Channel Table (ATSC).
dB	Decibels: A ratio of one quantity to another using logarithmic scales to give results related to human aural or visual perception. dB is a ratio whereas dBm, for example, is an absolute value, quoted as a ratio to a fixed point of 0 dBm. 0 dBm is 1 mW at 1 kHz terminated in 600Ω. 0 dBmV is 1 mV terminated in 75Ω.
DCE	Data Communications Equipment: Typically a modem. It establishes, maintains and terminates a session on a network but in itself is not the source (originator) or destination (end receiving unit) of signals (e.g. a computer, see DTE). A DCE device may also convert signals to comply with the transmission path (network) format.
DCT	Discrete Cosine Transform: A technique for expressing a waveform as a weighted sum of cosines. Raw video data is not readily compressible. DCT is not in itself a compression technique but is used to process the video data so that it is compressible by an encoder. DCT processes the picture on an 8x8-pixel block basis, converting the data from an uncompressible X Y form (as displayed by an oscilloscope) to a compressible frequency domain form (as displayed by a spectrum analyser). Can be forward DCT or inverse DCT.
DDS	Direct Digital Synthesiser.
Decoder	The unit containing the electronic circuitry necessary to decode encrypted signals. Some Decoders are separate from the receiver but in satellite TV broadcasting, the term is often used interchangeably as a name for an Integrated Receiver Decoder (IRD). The term IRD, or IRD / Decoder, is usually associated with satellite TV broadcasting while Cable systems are based on Converters or on Set-Top Boxes / Converters.
Decoding Time-stamp	A field that may be present in a PES packet header that indicates the time that an access unit is to be decoded in the system target Decoder.
DID	Data Identifier.
Differential Coding	Method of coding using the difference between the value of a sample and a predicted value.
DIL	Dual In Line: The most common type of package for small and medium scale integrated circuits. The pins hang vertically from the two long sides of the rectangular package, spaced at intervals of 0.1 inch.
DIN	Deutsches Institut für Normung: German Standards Institute.
Dolby Digital	Formerly AC-3. An audio coding system based on transform coding techniques and psychoacoustic principles.
Downlink	The part of the satellite communications circuit that extends from the satellite to an Earth station.
Downconvert	The process by which the frequency of a broadcast transport stream is shifted to a lower frequency range.
DPCM	Differential Pulse Code Modulation: An audio digitisation technique that codes the difference between samples rather than coding an absolute measurement at each sample point.
DSNG	Digital Satellite News-Gathering.
DSP	Digital Signal Processor.
DTE	Data circuit Terminating Equipment: A communications device that originates (is the source) or is the end receiving unit (destination) of signals on a network. It is typically a terminal or computer.
DTH	Direct To Home. The term used to describe uninterrupted transmission from the satellite directly to the subscriber, that is, no intermediary cable or terrestrial network utilised.
DTS	Digital Theater Systems: A motion picture digital sound system.
DVB	Digital Video Broadcasting: A European project which has defined transmission standards for digital broadcasting systems using satellite (DVB-S), cable (DVB-C) and terrestrial (DVB-T) medium, created by the EP-DVB group and approved by the ITU. Specifies modulation, error correction, etc. (see EN 300 421 for satellite, EN 300 429 for cable and EN 300 744 for terrestrial).
DVB SI	Digital Video Broadcasting Service Information.
DVB-PI	DVB-Professional Interfaces: TTV Lan search shows – DVB Physical Interfaces

Earth	<p>Technical Earth: Ensures that all equipment chassis within a rack are at the same potential, usually by connecting a wire between the Technical earth terminal and a suitable point on the rack. This is sometimes known as a Functional earth.</p> <p>Protective Earth: Used for electric shock protection. This is sometimes known as a safety earth.</p>
EBU	European Broadcast Union.
ECM	Entitlement Control Message.
EDI	Ethernet Data Input
EIA	Electronics Industries Association (USA).
EIT	<p>Event Information Table: Equipment: A component of the DVB-Service Information (SI) stream generated within an Encoder, containing information about events or programmes such as event name, start time, duration, etc.</p> <p>System: EIT (Present/Following) contains the name of the current and next event. It may include an optional descriptor (synopsis) giving brief details of content. EIT (Schedule) is used to produce a full EPG. The EIT is the only DVB-SI table, which can be encrypted.</p>
Elementary Stream	A generic term for a coded bit-stream, be it video, audio or other.
EMC	Electromagnetic Compatibility.
EMM	Entitlement Management Message.
Encryption	Encoding of a transmission to prevent access without the appropriate decryption equipment and authorisation.
EPG	Electronic Programme Guide: On-screen programme listing using thumbnail pictures and/or text.
Ethernet	The most widely used local area network (LAN) defined by the IEEE as the 802.3 standard. Transmission speeds vary according to the configuration. Ethernet uses copper or fibre-optic cables.
ETS	European Telecommunications Standard.
ETSI	European Telecommunications Standards Institute.
FCC	Federal Communications Commission.
FDM	Frequency Division Multiplex: A common communication channel for a number of signals, each with its own allotted frequency.
FEC	Forward Error Correction: A method of catching errors in a transmission. The data is processed through an algorithm that adds extra bits and sends these with the transmitted data. The extra bits are then used at the receiving end to check the accuracy of the transmission and correct any errors.
FFT	Fast Fourier Transformation: A fast algorithm for performing a discrete Fourier transform.
FIFO	First In, First Out: A data structure or hardware buffer from which items are taken out in the same order they were put in. Also known as a shelf from the analogy with pushing items onto one end of a shelf so that they fall off the other. A FIFO is useful for buffering a stream of data between a sender and receiver that are not synchronised - i.e. they not sending and receiving at exactly the same rate.
Footprint	The area of the Earth's surface covered by a satellite's downlink transmission. Also (generally) the area from which the satellite can receive uplink transmissions.
FTP	File Transfer Protocol: A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a Web site on a local machine, they are typically uploaded to the Web server, using FTP. Unlike e-mail programs in which graphics and program files have to be attached, FTP is designed to handle binary files directly and does not add the overhead of encoding and decoding the data.
G.703	The ITU-T standard which defines the physical and electrical characteristics of hierarchical digital interfaces.
GOP	Group of Pictures: MPEG video compression works more effectively by processing a number of video frames as a block. The TANDBERG Television Encoder normally uses a 12 frame GOP; every twelfth frame is an I frame.
GUI	Graphical User Interface: The use of pictures rather than just words to represent the input and output of a program. A program with a GUI runs under a windowing system and has a screen interface capable of displaying graphics in the form of icons, drop-down menus and a movable pointer. The on-screen information is usually controlled / manipulated by a mouse or keyboard.
HDTV	High Definition Television.
HPA	High Power Amplifier: Used in the signal path to amplify the modulated and up-converted broadcast signal for feeding to the uplink antenna.
HSYNC	Horizontal (line) SYNCs.
Hub	A device in a multipoint network at which branch nodes interconnect.
ICAM	Integrated Conditional Access Module: Embedded in the IRD and responsible for descrambling, plus packet filtering and reception. It also contains the physical interface to the subscriber's viewing card.
IEC	International Electrotechnical Committee.

IF	Intermediate Frequency: Usually refers to the 70 MHz or 140 MHz output of the Modulator in cable, satellite and terrestrial transmission applications.
Interframe Coding	Compression coding involving consecutive frames. When consecutive frames are compared, temporal redundancy is used to remove common elements (information) and arrive at difference information. MPEG-2 uses B and P frames, but since they are individually incomplete and relate to other adjacent frames, they cannot be edited independently.
Intraframe Coding	Compression coding involving a single frame. Redundant information is removed on a per frame basis. All other frames are ignored. Coding of a macroblock or picture that uses information only from that macroblock or picture. Exploits spatial redundancy by using DCT to produce I frames; these are independent frames and can be edited.
IP	Internet Protocol: The IP part of TCP/IP. IP implements the network layer (layer 3) of the protocol, which contains a network address and is used to route a message to a different network or sub-network. IP accepts packets from the layer 4 transport protocol (TCP or UDP), adds its own header to it and delivers a datagram to the layer 2 data link protocol. It may also break the packet into fragments to support the Maximum Transmission / Transfer Unit (MTU) of the network.
I-picture; I-frame	Intracoded Picture/Frame: A picture / frame, which is coded using purely intracoding with reference to no other field or frame information. The I frame is used as a reference for other compression methods.
IPPV	Impulse Pay Per View: One-time events, purchased at home (on impulse) using a prearranged SMS credit line.
IRD	Integrated Receiver Decoder: The Receiver with an internal MPEG Decoder, which is connected to the subscriber's TV. The IRD is responsible for receiving and de-multiplexing all signals. The unit receives the incoming signal and if CA is active, decodes the signal when provided with a control word by the viewing card. Domestic IRDs are also known as Set-Top Units or Set-Top Boxes.
IRE	Institute of Radio Engineers: No longer in existence but the name lives on as a unit of video amplitude measurement. This unit is 1% of the range between blanking a peak white for a standard amplitude signal.
ISDN	Integrated Services Digital Network: The basic ISDN service is BRI (Basic Rate Interface), which is made up of two 64 kbit/s B channels and one 16 kbit/s D channel (2B+D). If both channels are combined into one, called bonding , the total data rate becomes 128 kbit/s and is four and a half times the bandwidth of a V.34 modem (28.8 kbit/s). The ISDN high-speed service is PRI (Primary Rate Interface). It provides 23 B channels and one 64 kbit/s D channel (23B+D), which is equivalent to the 24 channels of a T1 line. When several channels are bonded together, high data rates can be achieved. For example, it is common to bond six channels for quality videoconferencing at 384 kbit/s. In Europe, PRI includes 30 B channels and one D channel, equivalent to an E1 line.
ISO	International Standards Organisation.
ISOG	Inter-union Satellite Operations Group.
ITS	Insertion Test Signal: A suite of analogue test signals placed on lines in the VBI. Also known as VITS.
ITT	Invitation To Tender.
ITU-R	International Telecommunications Union - Radiocommunications Study Groups (was CCIR).
ITU-T	International Telecommunications Union - Telecommunications Standardisation Sector (was CCITT).
JPEG	Joint Photographic Experts Group: ISO/ITU standard for compressing still images. It has a high compression capability. Using discrete cosine transform, it provides user specified compression ratios up to around 100:1 (there is a trade-off between image quality and file size).
kbit/s	1000 bits per second.
Kbit	1024 bits, usually refers to memory capacity or allocation.
Ku-band	The portion of the electromagnetic spectrum, which spans the frequency range of approximately 12 GHz to 14 GHz. Used by communications satellites. Preferred for DTH applications because this range of frequency is less susceptible to interference.
LAN	Local Area Network: A network, which provides facilities for communications within a defined building or group of buildings in close proximity.
L-band	The frequency band from 950 MHz to 2150 MHz, which is the normal input-frequency-range of a domestic IRD. The incoming signal from the satellite is down-converted to L-band by the LNB.
LED	Light Emitting Diode.
LNB	Low Noise Block Down-Converter: The component of a subscriber satellite transmission receiving dish which amplifies the incoming signal and down-converts it to a suitable frequency to input to the IRD (typically 950 MHz - 1600 MHz).
LO	Local Oscillator.
LSB	Least significant bit.
Luminance	The television signal representing brightness, or the amount of light at any point in a picture. The Y in YCrCb.

LVDS	Low Voltage Differential Signal: LVDS is a generic multi-purpose Interface standard for high speed / low power data transmission. It was standardised in ANSI/TIA/EIA-644-1995 Standard (aka RS-644).
Macroblock	A 16x16-pixel area of the TV picture. Most processing within the MPEG domain takes place with macro blocks. These are converted to four 8x8 blocks using either frame DCT or field DCT. Four 8 x 8 blocks of luminance data and two (4:2:0 chrominance format), four (4:2:2) or eight (4:4:4) corresponding 8 x 8 blocks of chrominance data coming from a 16 x 16 section of the luminance component of the picture. Macroblock can be used to refer to the sample data and to the coded representation of the sample values and other data elements.
Mbit/s	Million bits per second.
MCC	Multiplex Control Computer: A component of a System 3000 compression system. The MCC sets up the configuration for the System 3000 Multiplexers under its control. The MCC controls both the main and backup Multiplexer for each transport stream.
MCPC	Multiple Channels Per Carrier.
MEM	Multiplex Element Manager: A GUI based control system, part of the range of TANDBERG Television compression system control element products. The evolution 5000 MEM holds a model of the system hardware. Using this model, it controls the individual system elements to configure the output multiplexes from the incoming elementary streams. The MEM monitors the equipment status and controls any redundancy switching.
MMDS	Multichannel Microwave Distribution System: A terrestrial microwave direct-to-home broadcast transmission system.
Motion Compensation	The use of motion vectors to improve the efficiency of the prediction of sample values. The prediction uses motion vectors to provide offsets into the past and/or future reference frames or fields containing previously decoded sample values that are used to form the prediction error signal.
Motion Estimation	The process of estimating motion vectors in the encoding process.
Motion Vector	A two-dimensional vector used for motion compensation that provides an offset from the co-ordinate position in the current picture or field to the co-ordinates in a reference frame or field.
MP@ML	Main Profile at Main Level: A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 15 Mbit/s over various mediums.
MP@HL	Main Profile at High Level: A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 80 Mbit/s over various mediums.
MPEG	Moving Pictures Experts Group: The name of the ISO/IEC working group, which sets up the international standards for digital television source coding.
MPEG-2	Industry standard for video and audio source coding using compression and multiplexing techniques to minimise video signal bit-rate in preparation for broadcasting. Specified in ISO/IEC 13818. The standard is split into layers and profiles defining bit-rates and picture resolutions.
MSB	Most significant bit.
Msymbol/s	(Msym/s) Mega (million) Symbols per second (10^6 Symbols per second).
Multiplex	A number of discrete data streams (typically 8 to 12), from encoders, that are compressed together in a single DVB compliant transport stream for delivery to a Modulator.
MUSICAM	Masking pattern adapted Universal Sub-band Integrated Coding And Multiplexing: An audio bit-rate reduction system relying on sub-band coding and psychoacoustic masking.
Mux	Multiplexer: Transmission Multiplexer: receives EMMs from the ACC, ECMs from the BCC, video/audio data from the encoders, and the SI stream from the SIC. It then multiplexes them all into a single DVB-compliant transport stream, and delivers the signal to the uplink after modulation. The Multiplexer also contains the cypher card, which scrambles the services according to the control words supplied by the BCC.
Network	In the context of broadcasting: a collection of MPEG-2 transport stream multiplexes transmitted on a single delivery system, for example, all digital channels on a specific cable system.
NICAM	Near Instantaneously Companded Audio Multiplex: Official name is NICAM 728. Used for digital stereo sound broadcasting in the UK employing compression techniques to deliver very near CD quality audio. 728 refers to the bit-rate in kbit/s.
NIT	Network Information Table: Part of the service information data. The NIT provides information about the physical organisation of each transport stream multiplex, and the characteristics of the network itself (such as the actual frequencies and modulation being used).
nm	Nanometre: a unit of length equal to one thousand millionth (10^{-9}) of a metre.
NTSC	National Television Systems Committee: The group, which developed analogue standards used in television broadcast systems in the United States. Also adopted in other countries (e.g. Mexico, Canada, Japan). This system uses 525 picture lines and a 59.97 Hz field frequency.

NVOD	Near Video On Demand: Method of offering multiple showings of movies or events. The showings are timed to start at set intervals, determined by the broadcaster. Each showing of a movie or event can be sold to subscribers separately.
NVRAM	Non-volatile Random Access Memory: Memory devices (permitting random read / write access) that do not lose their information when power is removed. Stores the default configuration parameters set by the user.
OFDM	Orthogonal FDM: A modulation technique used for digital TV transmission in Europe, Japan and Australia; more spectrally efficient than FDM. In OFDM, data is distributed over a large number of carriers spaced apart at precise frequencies. The carriers are arranged with overlapping sidebands in such a way that the signals can be received without adjacent channel interference.
OPPV	Order ahead Pay Per View: An advance purchase of encrypted one-time events with an expiry date.
OSD	On-screen display: Messages and graphics, typically originating from the SMS, and displayed on the subscriber's TV screen by the IRD, to inform the subscriber of problems or instruct the subscriber to contact the SMS.
Packet	A unit of data transmitted over a packet-switching network. A packet consists of a header followed by a number of contiguous bytes from an elementary data stream.
PAL	Phase Alternating Line: A colour TV broadcasting system where the phase of the R-Y colour-difference signal is inverted on every alternate line to average out errors providing consistent colour reproduction.
PAT	Program Association Table: Part of the MPEG-2 Program Specific Information (PSI) data and is mandatory for MPEG-2 compliance. The PAT points (maps) to the PMT.
PCM	Pulse Code Modulation: A process in which a signal is sampled, each sample is quantised independently of other samples, and the resulting succession of quantised values is encoded into a digital signal.
PCR	Program Clock Reference: A time-stamp in the transport stream from which the Decoder timing is derived.
PDC	Programme Delivery Control (VBI): A Teletext service allowing simple programming (i.e. VideoPlus) of VCR recording times. If the desired program is rescheduled, PDC updates the programming information in the VCR.
Pel	Picture Element: Also known as a pixel. The smallest resolvable rectangular area of an image either on a screen or stored in memory. On screen, pixels are made up of one or more dots of colour. Monochrome and grey-scale systems use one dot per pixel. For grey-scale, the pixel is energised with different intensities, creating a range from dark to light (a scale of 0-255 for an eight-bit pixel). Colour systems use a red, green and blue dot per pixel, each of which is energised to different intensities, creating a range of colours perceived as the mixture of these dots. If all three dots are dark, the result is black. If all three dots are bright, the result is white.
PES	Packetised Elementary Stream: A sequential stream of data bytes that has been converted from original elementary streams of audio and video access units and transported as packets. Each PES packet consists of a header and a payload of variable length and subject to a maximum of 64 kbytes. A time-stamp is provided by the MPEG-2 systems layer to ensure correct synchronisation between related elementary streams at the Decoder.
PID	Packet Identifier: The header on a packet in an elementary data stream, which identifies that data stream. An MPEG-2 / DVB standard.
PIN	Personal Identification Number: A password used to control access to programming and to set purchase limits. Each subscriber household can activate several PINs and may use them to set individual parental rating or spending limits for each family member.
Pixel	PIX (picture) Element: The digital representation of the smallest area of a television picture capable of being delineated by the bit-stream. See Pel for more information.
pk-pk	peak to peak: Measurement of a signal or waveform from its most negative point to its most positive point.
PLL	Phase-Locked Loop. A phase-locked loop is a control system which controls the rotation of an object by comparing its rotational position (phase) with another rotating object as in the case of a sine wave or other repeating signal. This type of control system can synchronise not only the speed, but also the angular position of two waveforms that are not derived from the same source.
PMT	Program Map Table: Part of the MPEG-2 Program Specific Information (PSI) data and is mandatory for MPEG-2 compliance. Each service has a PMT, which lists the component parts (elementary streams of video, audio, etc.) for the various services being transmitted.
P-picture/P-frame	A picture / frame produced using forward prediction. It contains predictions from either previous I frames or previous P frames. The P frame is used as a reference for future P or B frames.
ppm	Parts per million.
PPV	Pay Per View: A system of payment for viewing services based on a usage / event basis rather than on on-going subscription. Subscribers must purchase viewing rights for each PPV event that they wish to view. PPV events may be purchased as IPPV or OPPV.
Program	PC - A sequence of instructions for a computer. TV - A concept having a precise definition within ISO 13818-1 (MPEG-2). For a transport stream, the timebase is defined by the PCR. The use of the PCR for timing information creates a virtual channel within the stream.

Programme	A linking of one or more events under the control of a broadcaster. For example, football match, news, film show. In the MPEG-2 concept, the collection of elementary streams comprising the programme, have a common start and end time. A series of programmes are referred to as events.
P _R P _B	Analogue Colour difference signals. Refer to C _R C _B for an explanation.
PROM	Programmable Read-Only Memory: A device, which may be written once with data for permanent storage, and then read whenever required. Special types of PROM permit the erasure of all data by Ultraviolet light (EPROM) or by application of an electronic signal (EEPROM).
PS	Program Stream: A combination of one or more PESs with a common timebase.
PSI	Program Specific Information: Consists of normative data, which is necessary for the demultiplexing of transport streams and the successful regeneration of programs. (<i>See also:</i> SI).
PSIP	Program System Information Protocol: The ATSC equivalent of SI for DVB.
PSK	Phase Shift Keying: A method of modulating digital signals particularly suited to satellite transmission.
PSR	Professional Satellite Receiver: <i>See also:</i> IRD.
PSU	Power Supply Unit.
PTS	Presentation Time Stamp (ATSC).
QAM	Quadrature Amplitude Modulation: A method of modulating digital signals, which uses combined techniques of phase modulation and amplitude modulation. It is particularly suited to cable networks.
QPSK	Quadrature Phase Shift Keying: A form of phase shift keying modulation using four states.
QSIF	Quarter Screen Image Format.
Quantise	A process of converting analogue waveforms to digital information. 8-bit quantisation as set out in ITU-R Rec. 601. uses 256 levels in the range 0 – 255 to determine the analogue waveform value at any given point. The value is then converted to a digital number for processing in the digital domain.
RAM	Random Access Memory: A volatile storage device for digital data. Data may be written to, or read from, the device as often as required. When power is removed, the data it contains is lost.
RAS	Remote Authorization System: A TANDBERG TV proprietary public-key encryption system used to prevent unauthorized viewing of a TV programme or programmes.
RF	Radio Frequency.
ROM	Read Only Memory: A non-volatile storage device for digital data. Data has been stored permanently in this device. No further information may be stored (written) there and the data it holds cannot be erased. Data may be read as often as required.
RS	Reed-Solomon coding: An error detection and correction, coding system. 16 bytes of Reed-Solomon Forward Error Correction code are appended to the packet before transmission, bringing the packet length to 204 bytes. The 16 bytes are used at the receiving end to correct any errors. Up to eight corrupted bytes can be corrected.
RLC	Run Length Coding: Minimisation of the length of a bit-stream by replacing repeated characters with an instruction of the form 'repeat character <i>x</i> <i>y</i> times'.
SCPC	Single Channel Per Carrier.
Spectral Scrambling	A process (in digital transmission) used to combine a digital signal with a pseudo-random sequence, producing a randomised digital signal that conveys the original information in a form optimised for a broadcast channel.
Scrambling	Alteration of the characteristics of a television signal in order to prevent unauthorised reception of the information in clear form.
SDI	Serial Digital Interface.
SDT	Service Description Table: Provides information in the SI stream about the services in the system; for example, the name of the service, the service provider, etc.
SELV	Safety Extra Low Voltage (EN 60950).
STB	Set-Top Box: A box that sits on top of a television set and is the interface between the home television and the cable TV company. New technologies evolving for set-top boxes are video-on-demand, video games, educational services, database searches, and home shopping. The cable equivalent of the IRD.
STT	System Time Table (ATSC).
SFN	Single Frequency Network: The SFN technique allows large geographic areas to be served with a common transmission multiplex. All transmitters in the network are synchronously modulated with the same signal and they all radiate on the same frequency. Due to the multi-path capability of the multi-carrier transmission system (COFDM), signals from several transmitters arriving at a receiving antenna may contribute constructively to the total wanted signal. The SFN technique is not only frequency efficient but also power efficient because fades in the field strength of one transmitter may be filled by another transmitter.

SI	Service Information: Digital information describing the delivery system, content and scheduling (timing) of broadcast data streams. DVB-SI data provides information to enable the IRD to automatically demultiplex and decode the various streams of programmes within the multiplex. Specified in ISO/IEC 13818[1]. (DVB)
Single Packet Burst Mode	A burst of ASI bytes (either 188 or 204, depending on packet length) is contiguously grouped into an MPEG-2 Transport Stream packet. Stuffing data is added between the packets to increase the data rate to 270 Mbit/s. See DVB Document A010 rev. 1, Section B3.3, (ASI) Layer-2 Transport Protocol.
Smart Card	A plastic card with a built-in microprocessor and memory used for identification, financial transactions or other authorising data transfer. When inserted into a reader, data is transferred to and from the host machine or a central computer. It is more secure than a magnetic stripe card and it can be disabled if the wrong password is entered too many times. As a financial transaction card, it can be loaded with digital money and used in the same way as cash until the balance reaches zero. The file protocol is specific to its intended application.
SMATV	Satellite Mast Antenna Television: A distribution system, which provides sound and television signals to the households of a building or group of buildings, typically used to refer to an apartment block.
SMPTE	Society of Motion Picture and Television Engineers.
SMS	Subscriber Management System: A system which handles the maintenance, billing, control and general supervision of subscribers to conditional access technology viewing services provided through cable and satellite broadcasting. An SMS can be an automatic (e.g. Syntellect) system where subscribers order entitlements by entering information via a telephone. Alternatively, an SMS can be a manual system, which requires subscribers to speak with an operator who then manually enters their entitlement requests. Some systems support multiple SMSs.
SNG	Satellite News-Gathering.
SNMP	Simple Network Management Protocol.
Spatial Redundancy	Information repetition due to areas of similar luminance and/or chrominance characteristics within a single frame. Removed using DCT and Quantisation (Intra-Frame Coding).
SPI	Synchronous Parallel Interface.
Statistical Redundancy	Data tables are used to assign fewer bits to the most commonly occurring events, thereby reducing the overall bit-rate. Removed using Run Length Coding and Variable Length Coding.
TAXI	Transparent Asynchronous Tx / Rx Interface: A proprietary high-speed data interface.
TCP / IP	Transmission Control Protocol/Internet Protocol: A set of communications protocols that may be used to connect different types of computers over networks.
TDM	Time Division Multiplex: One common, communications channel carrying a number of signals, each with its own allotted time slot.
TDT	Time and Date Table: Part of the DVB Service Information. The TDT gives information relating to the present time and date.
Temporal Redundancy	Information repetition due to areas of little or no movement between successive frames. Removed using motion estimation and compensation (Inter-Frame Coding).
Time-stamp	A term that indicates the time of a specific action such as the arrival of a byte or the presentation of a presentation unit.
TOT	Time Offset Table: This optional SI table supports the use of local offsets as well as the UTC time/date combination. The purpose of the table is to list by country the current offset from UTC and the next expected change to that offset (to track when daylight saving occurs). The offset resolution is to within 1 minute over a range of ± 12 hours from UTC.
Transport Stream	A set of packetised elementary data streams and SI streams, which may comprise more than one programme, but with common synchronisation and error protection. The data structure is defined in ISO/IEC 13818-1 [1] and is the basis of the ETSI Digital Video Broadcasting standards.
Transport Stream Packet Header	A data structure used to convey information about the transport stream payload.
TS	Transport Stream.
TSDT	Transport Stream Descriptor Table: A component of the MPEG-2 PSI data. This table describes which type of Transport stream it is in (i.e. DVB, ATSC etc.). It may also contain other descriptors.
TSP	Transport Stream Processor.
TVCT	Terrestrial Virtual Channel Table (ATSC).
U	44.45 mm (rack height standard).

UART	Universal Asynchronous Receiver Transmitter: A device providing a serial interface for transmitting and receiving data.
UHF	Ultra High Frequency: A portion of the electromagnetic spectrum covering 300 MHz to 3000 MHz (3 GHz).
Upconvert	The process by which the frequency of a broadcast transport stream is shifted to a higher frequency range.
Uplink	The part of the communications satellite circuit that extends from the Earth to the satellite.
UPS	Uninterruptable Power Supply: A method of supplying backup power when the electrical power fails or drops to an unacceptable voltage level. Small UPS systems provide battery power for a few minutes; enough to power down the computer in an orderly manner. This is particularly important where write back cache is used. Write back cache is where modified data intended for the disk, is temporarily stored in RAM and can be lost in the event of a power failure. Sophisticated systems are tied to electrical generators that can provide power for days. UPS systems typically provide surge suppression and may provide voltage regulation.
UTC	Universal Time Co-ordinate: An internationally agreed basis for timekeeping introduced in 1972 and based on international atomic time (corresponds to Greenwich Mean Time or GMT).
VCT	Virtual Channel Table (ATSC).
VHF	Very High Frequency: A portion of the electromagnetic spectrum covering 30 MHz to 300 MHz.
VITC	Vertical Interval Time Code.
VITS	Vertical Interval Test Signal: <i>See:</i> ITS.
VPS	Video Programming System: A German precursor to PDC
WSS	Wide Screen Switching: Data used in wide-screen analogue services, which enables a receiver to select the appropriate picture display mode.
WST	World System Teletext: System B Teletext. Used in 625 line / 50 Hz television systems (ITU-R 653).
XILINX	A type of programmable Integrated Circuit.
Y (Luminance)	Defines the brightness of a particular point on a TV line. The only signal required for black and white pictures.

Annex B

Technical Specification

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B.1 Host Controller Card (S11340)

B.1.1 RS-232/RS-485 Remote Control

This connector provides an RS-232/RS-485 control port that may be configured either as a local (terminal menu) or remote control port.

Table B.1: RS-232/RS-485 Control Specification

Item	Specification
Safety status:	SELV
Type:	ITU-T V.24/V.28 (RS-232D) asynchronous serial data
Connector designation:	RS-232/485
Connector type:	9-way D-type male
Termination:	High impedance / 100 Ω (RS-485 inputs only)
Supported Baud rates:	300, 600, 1200, 2400, 4800, 9600, 19200 (default), 38400 Baud
Data bits:	8
Parity:	None
Stop bits:	1
Flow control:	None
Control modes:	Terminal / remote
Local control:	VT100 compatible terminal menus
Remote control protocol:	See Chapter 5, RS-232 Remote Control Protocol and Chapter 6, RS-485 Remote Control Protocol

B.1.2 Ethernet Remote Control

Table B.2: Ethernet Remote Specification

Item	Specification
Safety status:	SELV
Connector designation:	ETHERNET 1 and ETHERNET 2
Connector type:	8-way RJ-45 socket, 10BaseT (ISO 882/3)
Control modes:	Remote control SNMP Remote Control Telnet FTP (Used for software/firmware download)
Remote control protocol:	See Chapter 5, RS-232 Remote Control Protocol and ST.TS.SNMP.E10052.

B.1.3 Reset/Status Port

This connector provides volt-free relay contacts for alarm and fail, and remote reset input.

Table B.3: Reset / Status Port Specification

Item	Specification
Safety status:	SELV
Connector designation:	RESET/STATUS
Connector type:	9-way D-type female
Alarm Contacts:	Change-over contacts (5 Ω in common)
Fail contacts:	Change-over contacts (5 Ω in common)
Reset contacts:	Short pins 9 and 5

B.2 DVB Transport Stream Input Interface Card (S11341) (Option 2)

Two DVB ASI inputs and one DVB SPI input are provided on the DVB Transport Stream Input Interface card. One of the three inputs is selected under user control as the input to the Modulator.

NOTES...

1. The S11341 DVB Transport Stream Input Interface Card is part of the S11756 assembly.
2. These inputs are available only if the DVB Transport Stream Input Interface option M2/SM5600/TS-INPUT is fitted.

B.2.1 DVB ASI IN

Table B.4: DVB ASI IN Specification

Item	Specification
Safety status:	SELV
Connector type:	BNC 75 Ω
Connector designation:	ASI IN 1 and 2
Compliance:	DVB Document A010 rev. 1, May 1997: Section 4.4
Input bit-rate range:	Defined by symbol rate range, modulation format, FEC code rate and input packet size as per <i>Table B.5, Input Bit-rate Ranges</i> .
Byte stuffing modes:	Byte and Single Packet Burst modes

Table B.5: Input Bit-rate Ranges

Modulation Format	FEC Code Rate	Bit-rate R_{188}		Bit-rate R_{204}	
		Min	Max	Min	Max
BPSK	1/2	0.460784	22.117647	0.500000	24.000000
	2/3	0.614379	29.490196	0.666667	32.000000
	3/4	0.691176	33.176471	0.750000	36.000000
	5/6	0.767974	36.862745	0.833333	40.000000
	7/8	0.806373	38.705882	0.875000	42.000000
QPSK	1/2	0.921569	44.235294	1.000000	48.000000
	2/3	1.228758	58.980392	1.333333	64.000000
	3/4	1.382353	66.352941	1.500000	72.000000
	5/6	1.535948	73.725490	1.666667	80.000000
	7/8	1.612745	77.411765	1.750000	84.000000
8PSK	2/3	1.843137	88.470588	2.000000	96.000000
	5/6	2.303922	110.588235	2.500000	120.000000
	8/9	2.457516	117.960784	2.666667	128.000000
16QAM	3/4	2.764706	132.705882	3.000000	144.000000
	7/8	3.225490	154.823529	3.500000	168.000000

B.2.2 DVB SPI IN

Table B.6: DVB SPI IN Specification

Item	Specification
Safety status:	SELV
Connector type:	25-way D-type female
Connector designation:	SPI IN
Compliance:	DVB Document A010 rev. 1, May 1997: Section 4.2
Input bit-rate range:	Defined by symbol rate range, modulation format, FEC code rate and input packet size as per <i>Table B.5</i> , subject to a maximum interface bit-rate of 108 Mbit/s.

B.3 50-180 MHz Satellite Modulator Card Assembly (S11417) (Option 1)

NOTES...

1. The S11417 50-180 MHz Satellite Modulator Card Assembly includes the S10309 Modulator Baseband Card and the S10310 IF Output Card.
2. These outputs are available only if the 50-180 MHz IF Output option M2/SM5600/IF-OUTPUT is fitted.

B.3.1 IF Outputs

Table B.7: IF OUT MAIN Specification

Item	Specification
Safety status:	SELV
Connector type:	BNC female 75 Ω
Connector designation:	IF OUT MAIN
Output impedance:	75 Ω
Output power:	-20 dBm to +5 dBm in 0.1 dB steps
Power level stability:	± 0.5 dB
Return loss:	>20 dB, 50-180 MHz
Modulation format:	BPSK as per ETSI TR 101 198 QPSK as per EN 300 421 (DVB-S) 8PSK and 16QAM as per EN 301 210 (DVB-DSNG) (customer options)
FEC rate:	1/2, 2/3, 3/4, 5/6 and 7/8 with QPSK 2/3, 5/6 and 8/9 with 8PSK 3/4, and 7/8 with 16QAM
Symbol rate:	1 to 48 Msymbol/s
Spectrum roll-off factor:	20%, 25%, 30%, 35% selectable
Spectrum sense:	Normal / inverted
Transmission modes:	Modulation on/off Carrier on/off
Carrier frequency:	50-180 MHz, tuneable in 1 kHz steps
Carrier frequency error:	< ±1 kHz (all causes over 10 years)
Carrier ON/OFF ratio:	>60 dB
Carrier suppression:	>40 dB
Phase noise:	< -66 dBc/Hz at 100 Hz offset < -76 dBc/Hz at 1 kHz offset < -86 dBc/Hz at 10 kHz offset < -96 dBc/Hz at 100 kHz offset < -120 dBc/Hz at 1 MHz offset and above
Spurious outputs (modulated carrier):	< -60 dBc/4 kHz over the frequency range 0 to 500 MHz but excluding the frequency range of the wanted output signal (equal to ±1.06 × Symbol Rate about the carrier frequency, as defined by the spectrum mask <i>Figure A. 1</i> in EN 300 421)
Spurious outputs (unmodulated carrier):	< -55 dBc, each component
Noise floor (N ₀ /C):	< -120 dBc/Hz
Main / monitor output isolation (both directions):	>30 dB, 50-180 MHz

Table B.8: IF OUT MONITOR Specification

Item	Specification
Safety status:	SELV
Connector type:	BNC female 75 Ω
Connector designation:	IF OUT MONITOR
Output impedance:	75 Ω
Output power:	-20 dB ±2 dB relative to main IF output power
Return loss:	>20 dB, 50-180 MHz

B.3.2 Aux Control Input

This input provides an electrically hard-wired means of muting the IF output by an external relay contact closure or an externally applied voltage.

Table B.9: Aux Control Specification

Item	Specification
Safety status:	SELV
Connector type:	9-way D-type, male
Connector designation:	AUX CONTROL

B.4 L-Band Modulator Card Assembly (S12693) (Alternative Option 1)

NOTES...

1. The S12693 L-Band Modulator Card Assembly includes the S10309 Modulator Baseband Card and the S11291 L-Band Output Card.
2. These inputs and outputs are available only if the L-Band Output option SM5600/LBAND-OUT is fitted.

B.4.1 L-Band Input

This input provides a carrier combining facility for summing an externally generated carrier into the L-band output.

Table B.10: L-BAND IN Specification

Item	Specification
Safety status:	SELV
Connector type:	SMA female 50 Ω
Connector designation:	L-BAND IN
Input impedance:	50 Ω
Gain to L-BAND OUT MAIN output:	0 dB ±2 dB
Input power:	+5 dBm max
Return loss:	>14 dB, 950-1750 MHz

B.4.2 L-Band Outputs

Table B.11: L-BAND OUT MAIN Specification

Item	Specification
Safety status:	SELV
Connector type:	SMA female 50 Ω
Connector designation:	L-BAND OUT MAIN
Output impedance:	50 Ω
Output power:	-20 dBm to +5 dBm in 0.1 dB steps
Output power ramp rate:	9 dB/s over operational power level range
Power level stability:	± 0.5 dB
Return loss:	>14 dB, 950-1750 MHz
Modulation format:	BPSK as per ETSI TR 101 198 QPSK as per EN 300 421 (DVB-S) 8PSK and 16QAM as per EN 301 210 (DVB-DSNG) (customer options)
FEC rate:	1/2, 2/3, 3/4, 5/6 and 7/8 with QPSK 2/3, 5/6 and 8/9 with 8PSK 3/4, and 7/8 with 16QAM
Symbol rate:	1 to 48 Msymbol/s
Spectrum roll-off factor:	20%, 25%, 30%, 35% selectable
Spectrum sense:	Normal / inverted
Transmission modes:	Modulation on/off Carrier on/off
Carrier frequency:	950-1750 MHz, tuneable in 1 kHz steps
Carrier frequency error:	< ±35 Hz versus temperature < ±1 kHz ageing over 10 years
Carrier ON/OFF ratio:	>60 dB
Carrier suppression:	>35 dB
Phase noise (continuous):	< -46 dBc/Hz at 10 Hz offset < -66 dBc/Hz at 100 Hz offset < -76 dBc/Hz at 1 kHz offset < -86 dBc/Hz at 10 kHz offset < -96 dBc/Hz at 100 kHz offset < -120 dBc/Hz at 1 MHz offset and above
Phase noise (discrete sidebands):	< -70 dBc
Spurious outputs (modulated carrier):	< -60 dBc/4 kHz over the frequency range 500 MHz to 2500 MHz but excluding the frequency range of the wanted output signal (equal to $\pm 1.06 \times$ Symbol Rate about the carrier frequency, as defined by the spectrum mask <i>Figure A.7</i> in EN 300 421)
Spurious outputs (unmodulated carrier):	< -55 dBc over the frequency range 500 MHz to 2500 MHz, each component
Noise floor (N ₀ /C):	< -120 dBc/Hz
Main / monitor output isolation (both directions):	>30 dB, 950-1750 MHz

Table B.12: L-BAND OUT MONITOR Specification

Item	Specification
Safety status:	SELV
Connector type:	F-type female 75 Ω
Connector designation:	L-BAND OUT MONITOR
Output impedance:	75 Ω
Output power:	-30 dB nominal relative to main L-band output power
Return loss:	>10 dB, 950-1750 MHz

B.4.3 Reference Frequency Output

A reference frequency output is provided via the L-BAND OUT MAIN connector, intended for use by an external frequency up-converter.

Table B.13: Reference Frequency Output Specification

Item	Specification
Output power:	0 dBm ±3 dB sine-wave into 50 Ω load Switchable on/off
Frequency:	10 MHz
Frequency stability:	< ±0.2 Hz versus temperature < ±1 Hz ageing over 1 year < ±5.5 Hz ageing over 10 years
Phase noise:	-110 dBc/Hz at 10 Hz offset -135 dBc/Hz at 100 Hz offset -155 dBc/Hz at 1 kHz offset -160 dBc/Hz at 10 kHz offset

B.4.4 DC Power Output

A dc power output is provided via the L-BAND OUT MAIN connector, intended for powering an external frequency up-converter.

Table B.14: DC Power Output Specification

Item	Specification
Voltage (open circuit):	+24 V nominal, switchable on/off
Output resistance:	1 Ω nominal
Ripple:	<100 mV pk-pk
Rated current:	500 mA max, short-circuit protected
Short-circuit current:	<1 A
Short-circuit duration:	Indefinite (automatic shutdown after approx. 2s)

B.4.5 Aux Control Input

This input provides an electrically hard-wired means of muting the L-band output by an external relay contact closure or an externally applied voltage.

Table B.15: Aux Control Specification

Item	Specification
Safety status:	SELV
Connector type:	9-way D-type, male
Connector designation:	AUX CONTROL

B.5 Maintenance / Upgrade

Software on the S11340 Host Controller Card, and software and firmware on the S10309 Modulator Baseband Card may be updated by FTP via the Ethernet ports.

B.6 Power Supply

This equipment is fitted with a wide-ranging power supply. It is suitable for supply voltages of 100-120 Vac -10% +6% or 220-240 Vac -10% +6% at 50/60 Hz nominal.

Table B.16: Power Supply Specification

Item	Specification
Power distribution system:	Type TN ONLY (EN 60950 para 1.2.12.1): Power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to that point by protective earth conductors. This equipment must NOT be used with single-phase three-wire and PE, TT or IT Type Power distribution systems.
Connection to supply:	Pluggable Equipment Type A (EN 60950 para 1.2.5): Equipment which is intended for connection to the building power supply wiring via a non-industrial plug and socket-outlet or a non-industrial appliance coupler or both. Correct mains polarity must always be observed. Do not use reversible plugs with this equipment.
Class of equipment:	Class I Equipment (EN 60950 para 1.2.4): electric shock protection by basic insulation and protective earth.
Rated voltage:	100-120 / 220-240 Vac (single phase)
Rated frequency:	50/60 Hz
Voltage selection:	Wide-ranging
Rated current:	2 A (100 - 120 V range) 1 A (220 - 240 V range)
Input connector:	CEE 22/IEC 320 3-pin male receptacle
Fuse:	Fuse in live conductor in power input filter at rear of unit. Do not use reversible plugs with this equipment.
Fuse type:	Bussmann S505 series Littelfuse 215 series 5x20 mm time delay (T) 1500 A breaking capacity (HBC) IEC/EN 60127-2 Sheet 5
Fuse current rating:	5 A (T) for 100 – 120 V operation 5 A (T) for 220 – 240 V operation
Consumption:	60 W nominal

B.7 Physical Details

Table B.17: Physical Details

Item	Specification
Height:	44 mm, 1U chassis
Width:	444 mm excluding fixing brackets
Overall width:	482 mm including fixing brackets
Depth:	527 mm excluding rear connector clearance
Overall depth:	548 mm including rear connector clearance
Approximate mass:	8kg (17.6 lb)
Rack mounting case:	19 inch width, 1U height

B.8 Environmental Conditions

Table B.18: Environmental Specification

Item	Specification
Operational	
Temperature:	0°C to +50°C (32°F to 122°F) ambient with free air-flow
Relative humidity:	0% to 90% (non-condensing)
Cooling requirements:	Forced air cooling
Handling/movement:	Designed for fixed use when in operation
Ventilation:	Fans are located at the left-hand side of the unit, utilising front air intake for the PSU compartment
Waterproofing:	Front panel is splash-proof
Storage/Transportation	
Temperature:	-20°C to +70°C (-4°F to 158°F)
Relative humidity:	0% to 90% (non-condensing)
Shock/Vibration:	This equipment has been designed and tested to meet the standards listed in <i>Table B.19: Vibration Specification</i>

Table B.19: Vibration Specification

Standard	Region	Specification
ETS 300 019-2-5 Table 2, Normal attitude only	European	Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-5: Specification of environmental tests; Ground vehicle installations.

B.9 Compliance¹

B.9.1 Safety

This equipment has been designed and tested to meet the requirements of the following:

EN 60950	European	Safety of information technology equipment including business equipment.
IEC 60950	International	Safety of information technology equipment including business equipment.

In addition, the product has been designed to meet the following:

UL 1950	USA	Safety of information technology equipment including business equipment.
---------	-----	--

B.9.2 EMC²

This equipment has been designed and tested to meet the following:

EN 55022 and AS/NZS 3548	European Australia and New Zealand	Emission Standard Limits and methods of measurement of radio frequency interference characteristics of information technology equipment - Class A.
EN 61000-3-2	European	Electromagnetic Compatibility (EMC), Part 3 Limits; Section 2. Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
EN 61000-3-3	European	Electromagnetic Compatibility (EMC), Part 3. Limits; Section 3. Limitation of voltage fluctuations and flicker in low voltage supply systems for equipment with rated current ≤ 16 A.
EN 55024	European	Information technology equipment – Immunity characteristics – Limits and methods of measurement
FCC	USA	Conducted and radiated emission limits for a Class A digital device, pursuant to the Code of Federal Regulations (CFR) Title 47-Telecommunications, Part 15: Radio frequency devices, subpart B - Unintentional Radiators.

¹ The version of the standards shown is that applicable at the time of manufacture.

² The EMC tests were performed with the Technical earth attached, and configured using recommended cables.

B.9.3 CE Marking



The CE mark is affixed to indicate compliance with the following Directives:

89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

73/23/EEC of 19 February 1973 on the harmonisation of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits.

NOTE...

The CE mark was first affixed to this product in 2001.

B.9.4 C-Tick Mark



The C-Tick mark is affixed to denote compliance with the Australian Radiocommunications (Compliance and Labelling – Incidental Emissions) Notice made under s.182 of Radiocommunications Act 1992.

NOTE...

The C-Tick mark was first affixed to this product in 2001.

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Quick Reference Guide

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C.1 Controlling the Modulator

C.1.1 Power-On

At power on, the configuration at last power on is restored.

C.1.2 The System Set-up

The Modulator may be controlled either by the Front Panel, Terminal via a serial link, or an Ethernet connection.

C.1.3 Front Panel Control

General

Full control and monitoring of the Modulator is provided via the front panel. Refer to *Figure C.1* to get acquainted with the pushbuttons on the Front Panel.

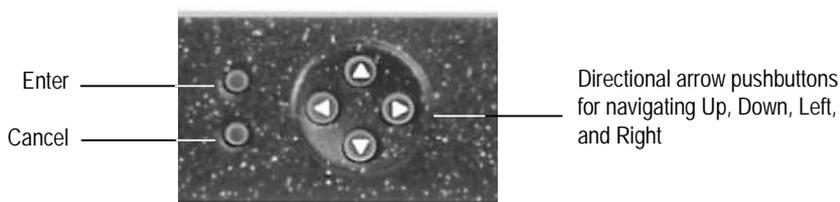


Figure C.1: Front Panel Pushbuttons

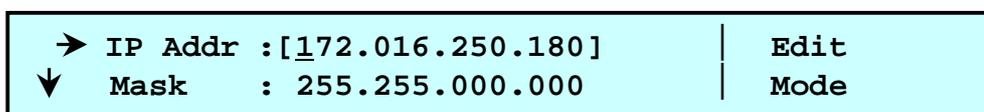
Setting the IP Address from the Front Panel

To set the IP address and other networking parameters from the front panel, perform the following:

1. Select the **System Menu** from the **Main Menu**. If the Main Menu is not the current display, press **Cancel** until Main Menu is displayed on the right of the screen. The System Menu is the fifth option in the Main Menu; press the down arrow until it is selected:



2. Enter the **System Menu** by pressing **Enter**.
3. Select the **Network Settings** menu which is the first item in the system menu. Press **Enter** to enter the menu.
4. The IP address, subnet mask, gateway IP address and gateway enable state can now be edited. To change an item, select it using the up and down keys, then press **Enter** on the item you wish to change. The current digit being edited is underlined in the following IP Address:



5. Press the up and down arrow pushbuttons to cycle through the characters. Use the left and right keys to navigate along the address. When finished, press **Enter** to confirm the change. To cancel the change, press **Cancel**.

NOTE...
Erroneous address settings cannot be saved.

6. Repeat for all the network settings.

Configuring from the Front Panel

1. Select the **Configuration Menu** from the **Main Menu** (the fourth item).
2. Select the **Change Configuration** option from the Configuration Menu. Similar to the following will be displayed:

→ Data Select	: ASI 1	Change
↓ Packet Size	: 204 Bytes	Config

3. To change a setting, position the arrow next to the item to change using the up and down arrow pushbuttons, then press **Enter**. This will start **Edit Mode** on the selected item.
4. Use the up and down pushbuttons to cycle through the available options. When the desired option is displayed, press **Enter**.
5. This procedure is the same for changing parameters.

C.1.4 Terminal Control

Terminal Control Setup

1. Connect one end of a null modem serial cable to the connector labelled RS-232/485 on the rear panel of the Modulator and the other end to a terminal or PC running a terminal emulator.
2. Ensure the Modulator is configured as follows:

Port Mode: Terminal
Interface: RS-232
Baud Rate: 19200

Refer to *C.1.3 Front Panel Control* if changes are necessary.

3. Configure the terminal as follows:

Baud Rate: 19200
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

4. When a terminal emulator is being used, set the emulation to VT100.
5. Once connected, a menu should be displayed. If not, press **Enter**.
Having accessed the menu, refer to *Configuring from a Terminal*.

Configuring from a Terminal

The **Main Menu** (*Figure C.2*) provides options for configuring and testing the Modulator. It also allows a password to be set to prevent access to the menu system. The Main Menu shown is automatically displayed immediately after the boot display screen. Each of the options on this top-level menu provide access to further sub-menus.

```
TANDBERG Television SM5600 Satellite Modulator: Merlin

Main Menu

1 =Quick Setup Menu=
2 =Alarms Menu=
3 =Configuration Menu=
4 =System Menu=
5 =Log Menu=
6 =Test Menu=
7 =Software Update Menu=
H Help
X Exit session

Status: No Alarms
Please enter your selection, then press Enter:
```

Figure C.2: Main Menu

1. Type **1** at the prompt to enter the **Quick Setup Menu** (*Figure C.3*) from the **Main Menu**. This menu provides the following options:

```
Quick Setup Menu

1 Data Select : ASI 1           10 IF Frequency : 70.000 MHz
2 Packet Size : 188 bytes      11 IF Power     : -10.0 dBm
3 Error Flag  : OFF           12 IF Output    : ON
4 Bit Rate   : 30.000000 Mbit/s 13 Mod. State   : ON
5 Symbol Rate : 21.702128 Msym/s 14 IF Spectrum  : Normal
6 Coding Mode : DVB            15 IF Low Power : -20.0 dBm
7 Modulation  : QPSK           16 Carrier Act. : Norm. Power
8 FEC Rate    : 3/4            H Help
9 Roll-off    : 35 %           Q Quit

Alarm/Fail Status in inverted text shown here (if any)

Please enter your selection, then press Enter:
```

Figure C.3: Quick Setup Menu

2. Enter the relevant number, then press **Enter** (↵). To return to the **Main Menu** type **Q**.

Setting the IP Address from a Terminal

To set the IP address and other networking parameters from the terminal, perform the following:

1. Select the System menu from the main menu. If you are not at the **Main Menu**, select **Quit** from the current menu and repeat until the Main Menu is reached. The System menu is the fourth option. To select it type **4** then press **Enter**.
2. Select the **Ethernet Configuration** menu (the third option).
3. You now have the options to display the current setting, or modify the IP address, subnet mask and gateway IP address. There is also the option to view the current settings and status of the two Ethernet connectors on the rear panel.
4. To set the IP address, select Modify IP Address. Similar to the following will be displayed:

```
Current IP Address = 172.16.250.180
Do you want to change it (Y/N)?:
```

5. To modify the address, type **Y**. You will then be prompted for the new address.
6. To modify the gateway, or its usage, select Modify Gateway IP address. You will first be prompted for the IP address, then the enable state.

C.1.5 Ethernet Control

Ethernet Control Setup

1. Before network control can be used, the IP address must be entered. This can be done from the front panel. Refer to *Setting the IP Address from the Front Panel* on page C-3.
2. Connect an RJ-45, twisted pair network cable to either the ETHERNET 1 or ETHERNET 2 connector. The Modulator supports only 10 Mbit/s TCP/IP networks.
3. A Telnet program is supplied with Microsoft Windows and may be used to control the Modulator. To set up Telnet, from DOS, type **telnet <domain name server>** or **telnet <IP address>**.
4. Enter the default user name and password which are both **root**.
5. When connected and logged in, the standard terminal interface is presented. Refer to *Configuring from a Terminal* on page C-5.

- To ensure correct communications, select the **Preferences** option from the **Terminal** menu and select the following parameters:

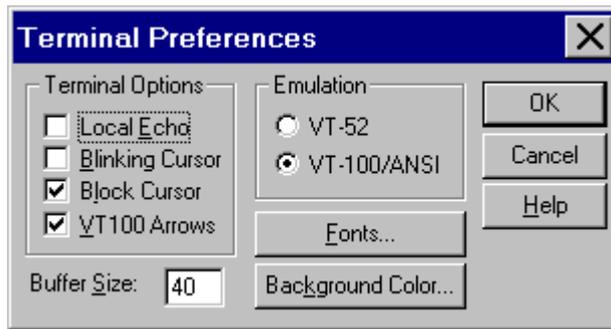


Figure C.4: Telnet Terminal Preferences Dialog Box

Establishing Telnet Control

To connect to the Modulator using the Microsoft Telnet program, perform the following:

- From the Connect menu, select **Remote System....**

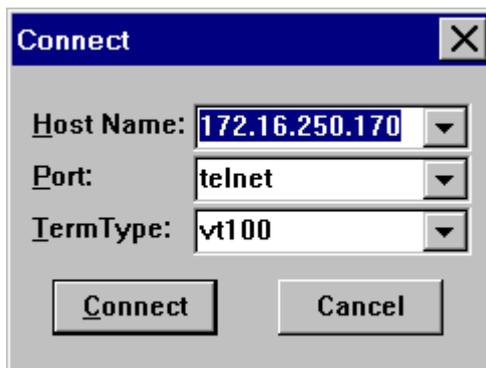


Figure C.5: Telnet Connect Dialog Box

- Enter the IP address of the Modulator and click **Connect**.
- A user name and password is necessary to gain access to the Modulator. Both the default user name and the default password are **root**.

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